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The Adoption and Impact of Computer Integrated Prepress Systems in the Printing and Publishing Industries of Kuwait

A thesis submitted to Middlesex University
in partial fulfilment of the requirements for the degree of
Doctor of Philosophy

By

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School of Visual Communication Design
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Abstract

This research is aimed at developing a comprehensive picture of the implications of digital technology in the graphic arts industries in Kuwait. The purpose of the study is twofold: (1) to explore the meaning of the outcomes of recent technological change processes for the traditional prepress occupations in Kuwait; and, (2) to examine the impact of technology on Arabic layout and design. The study is based on the assumption that technological change is a chain of interactions among the sociological, cultural, political and economic variables. The prepress area in Kuwait has its own cultural, social, economic, and political structure. When a new technology is introduced it is absorbed and shaped by the existing structure.

Based on such a dialectical conceptualisation, four major levels of analysis can be distinguished in this study: (1) technological change in the graphic arts industries; (2) the typographic evolution of the Arabic script; (3) the workers themselves as individuals and occupational collectives; and, (4) technology's impact on Arabic publication design. The methodological approach selected for this study can be defined as a dialectical, interpretive exploration. Given the historical perspective and the multiple levels of analysis, this approach calls for a variety of data gathering methods. Both qualitative and quantitative data were sought. A combination of document analysis, participant observation and interviewing allow to link the historical and current events with individual and collective actions, perceptions and interpretations of reality.

The findings presented in this study contradicts the belief that the widespread adoption of new production processes is coincidental with continuous advances in scientific knowledge which provide the basis for the development of new technologies. Instead, the changes have been hindered by the lack of untrained personnel, the Arabic software incompatibility, and the lack of informed decisions to successfully implement the technology. Without any doubt, the new technology has influenced Arabic calligraphy, but this does not mean the decay of Arabic calligraphy as an art. As this study shows, the challenge is not to the art, but to the artist.

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INTRODUCTION

Technological innovations and advanced methods in microprocessing technology are bringing about an unprecedented revolution in the graphic arts industries worldwide. This research is an attempt to capture the dynamics of technological change processes in a specific economic sector, the Kuwaiti printing and publishing industries. The central part of this study is aimed at developing a comprehensive picture of the implications of this technological revolution, viz., the introduction of computer integrated prepress systems in the printing and publishing industries in Kuwait. The new technology is a special challenge to a developing country such as Kuwait, since it has originated in the West and generally requires highly sophisticated personnel and infrastructure. The purpose of the study is twofold: (1) to explore the meaning of the outcomes of recent technological change processes for the traditional prepress occupations in the Kuwaiti printing and publishing industries; and, (2) to examine the impact of the new technology on the design of Arabic publications and to find out whether there is a detectable change in their visual appearance (design and layout) because of the switch to computer prepress.

Since the end of the eighteenth century the process of industrialisation has been bound with technological change. In this sense, there is nothing 'new' about the idea of 'new technology'. However, in recent years journalists, governments, and academic commentators have viewed the latest developments in microelectronic technology as sufficiently distinctive, dramatic, and far-reaching to warrant the title 'new technology' (McLoughlin & Clark, 1992). The importance of the

recent, and anticipated technological innovations, based on the development of microelectronics and computer-based manufacturing, has been equated with that of the digital revolution. Computers have changed the construction of our knowledge and the nature of our awareness. They have changed our language and our means of communication. The interaction between these technological developments and profound changes in the social production process and concomitantly in social life has become a widely discussed topic.

Apart from the interest this topic has triggered in academic disciplines such as economics, organisational psychology, and sociology, questions about the impact of technological innovations have become a top media issue. Hardly a day passes without a newspaper reporting conferences and studies on what the future high-technology society might look like. This public debate, with very few exceptions, creates the image that large scale societal changes flowing from technological innovations are inevitable and presumably progressive. The core issues emphasised, and defined in economic terms, are maintaining or achieving the competitive industrial edge internationally, cutting costs and increasing productivity. Worker displacement and dislocation as a predicted result are largely viewed as inevitable 'side-effects' (Carter, 1984). Contextual studies including geography, culture, and social backgrounds are critical in determining technological change in developing countries. Development research has suggested that technological change is a chain of interactions among the sociological, cultural, political and economic variables (see Lerner, 1956; Pye, 1963; Schramm, 1964; Rogers & Shoemaker, 1971; Salem, 1990).

Based on such a dialectical conceptualisation, the analysis of the determinants and outcomes of technological change calls for a micro- as

well as a macro-perspective which includes the exploration of the perceptions, strategies and interactions of the different groups involved. The problem which gives rise to the particular approach to research and method guiding this study is based on the assumption that the prepress production area of Arabic publications has its own social structure, along with a set of values, procedures and traditions, some related to Arabic language and design. These social and cultural factors do not easily change; instead, when a new technology such as computer prepress is introduced, it is shaped by the existing structure. Therefore while the technology itself may be revolutionary in the West, its effect for the moment in Kuwait has been mitigated by the environment. The existing social structure and culture are broad enough to absorb it and shape it, rather than being shaped and absorbed themselves. This hypothesis represents the framework from which the more specific research questions were developed.

A Multidimensional Approach to Problem Definition

This study is based on the proposition that the analysis of social action or social systems requires a multidimensional approach which attempts to synthesise and integrate materialist and idealist aspects of reality without adopting either in an exclusive way. Accepting the premise that the 'facts' of the subjective and objective realms of reality fall under different criteria of evidence (Robinson, 1996), it follows that the world consists of material as well as mental/experiential phenomena which have to be analysed dialectically.

This dialectical perspective of the social world, seen as a system in flux, requires a view from within, the researcher's insertion into a landscape, social setting or system, in order to understand the meaning of any phenomenon, one must be an insider — a participant in both its process

and structure. This research, therefore, includes a focus on the individual experiences without neglecting the social arrangements and structures. This implies a “collective-interactionist perspective which sees the plurality of social action as interrelated and ordered as the result of prior structures of patterns” (Robinson, 1996).

In order to relate this conceptual framework to the analysis of the graphic arts industries in Kuwait, the dimensions to be explored need to be defined more specifically. For this purpose, we turn to the ‘diffusion and adoption of innovations’ model developed by Rogers (1983). This model is based on the elements and processes by which new ideas or practices are spread to members of a social system over time and either adopted or rejected by them. Rogers (1983) described the four elements as (a) the innovation, (b) which is communicated through certain channels, (c) in a social system, (d) over time.

Researchers such as Rogers (1983) studying the adoption and diffusion of innovations have investigated various aspects of this model or concept, such as the socioeconomic characteristics, personality variables, and communication behaviour. This researcher studied the adoption of computer prepress systems by commercial printing firms in Kuwait by using this model (innovation, communication, social system and time) to determine whether commercial printers in Kuwait are adopting this technological innovation and, if so, what factors influence their decision to adopt; and secondly to determine whether, and to what extent, professional and personal characteristics of printing managers influence the adoption of this innovation.

Research Questions

In this perspective, the printing and publishing industries are viewed as economic and social structure consisting of different interacting sub-systems, which are embedded in a broader economic and social environment. At a general level this gives rise to the following research questions:

1. To what extent have managers of commercial printing firms in Kuwait adopted computer integrated prepress systems?
2. What factors influence the adoption of computer integrated prepress systems by managers of commercial printing firms in Kuwait?
3. How is the new technology affecting the people involved in the process — their jobs, their responsibilities?
4. Is there a detectable change in the visual appearance (defined here as design and layout) of Arabic publications as a result of the new technology?

For analytical purposes, four major levels of analysis can be distinguished: (1) technological change in the graphic arts industries; (2) the typographic evolution of the Arabic script; (3) the workers themselves as individuals and occupational collectives; and, (4) technology's impact on Arabic publication design. At these levels, the following, more specific questions which guided the research process can now be formulated:

Level 1 (Graphic arts industries): In what ways have the particular developments in the socio-economic environment such as economic growth/recession, labour markets, new technological equipment, and available organisational resources interacted with managerial philosophies/ideologies and resulting strategies to shape the emerging

patterns and outcomes of technological change? What role have the characteristics of relationships in terms of competition, consumer demands, technology supplier-buyer interaction played in these decision-making and restructuring processes?

Level 2 (The Arabic context) : Given that Arabic type is so closely related to calligraphy, what are the underlying social and cultural values which have shaped the Arabic calligraphic system? What are the connotative and affective values associated with Arabic calligraphy and type styles? What are the specific orthographic reforms which resulted in the computerisation of Arabic and its adaptation to the existing printing technology?

The analysis of these questions provides the structural developmental framework in order to understand the transformation of the craft occupations in this industry as the central aspect of this study. At this level the problem is guided by the following questions:

Level 3 (Workers): In what ways have the characteristics of the dynamics of technological change altered the work environment, work organisation, tasks and skill requirements? What is the nature of the concomitant changes in the horizontal social relationships between workers as individuals and as occupational collectives, between workers and their unions, and, on a vertical level, between workers/ occupational collectives and management?

Level 4 (Content): What are the features associated with computer based graphic design? What are the underlying values and perceptions about technology's impact on Arabic magazine design?

Based on this framework for a multidimensional problem analysis and the research questions which flow from it, an overview of the methodological implications will be examined.

Methodology

The methodological approach selected for this study can be defined as a dialectical, interpretive exploration. Though guided by a conceptual framework and informed by a critical review of the literature, the broadly formulated questions are intended to generate relevant concepts and working hypotheses from the data itself. Given the historical perspective and the multiple levels of analysis, this approach calls for a variety of data gathering methods. Both qualitative and quantitative data were sought. A combination of document analysis, observation and interviewing allows for the linking of historical and current events with individual and collective actions, perceptions and interpretations of reality.

Such a dialectical encounter with the living, changing reality implies a view from within, an attitude of openness and willingness to learn. Rather than being the expert, the researcher enters into a dialogue with the contextual setting and becomes involved in a process of mutual discovery, in the lived, dynamic relationship among people. Inquiry, thus, becomes a continual process, an ever evolving questioning about the nature of the problem. This attitude has guided the writer's approach to the field research which is described in detail in chapter six: Research Method and Procedures.

Significance of the Study

In spite of considerable research interest related to the adoption of new technologies in areas such as manufacturing, banking, education,

medicine, and agriculture, research effort in the area of technological change in the graphic arts industries in the Arab Gulf states is almost non-existent. The study is potentially important because it combines theoretical conceptualisation with practical fieldwork. It contributes to the literature on technological change in the printing industry by providing researchers, educators, and distributors with a thorough understanding of the factors that influence the adoption of computer prepress systems in a developing country. It also offers managers in commercial printing firms in Kuwait an informed awareness of the potential uses of computer prepress in order to improve their operations.

This study is vital because it seeks to document the Arabic graphic designer's transition from traditional tools to digital technologies. It is important because it makes available individual experiences with this type of transition to the many designers in the Arab world who currently find themselves either in the process of transition, or facing the need to make the change. This study is noteworthy because it seeks to demystify this transitional process, and shed light on the prepress development process in the graphic designer's new digital environment. It is hoped to apprise Arabic graphic designers of the new possibilities as well as problem areas, and to encourage them to take advantage of digital prepress technologies. In addition, this study points out the benefits and drawbacks of transition in education and practice.

Due to the fact that new technologies change exponentially, people in production industries, design businesses, and schools are finding that there are no guidelines. Design educators in Kuwait and others will find the investigation resourceful as they struggle to keep pace, discover the

rules, and find time for experimentation and the refinement of skills. According to Richmond (1990), creative professionals are always eager to know what their colleagues are doing with computers. Practicing graphic designers in design studios and corporate design departments in Kuwait will benefit from this data which approaches graphic design as a discipline which uses computers to assist in realising the opportunities in other digital media. This research is meaningful because it may aid in the effort to increase the services offered by design offices in Kuwait, and may expose the designer to innovative methods for offering clients and consumers fresh ways of identifying, understanding, and accessing information.

The objectives of this study attempt to make inroads into yet uncharted ground. The study will provide a base from which to launch research into the impact of the computer on the Arabic designer's approach towards the use of the computer as a design tool. Results of this study will offer preliminary insight into the ramifications of computer technology and its impact on Arabic publications. The largest contribution of this study is a theoretically based approach to measuring any impact on the creative problem-solving process pertaining to Arabic design, and appropriate identification of yardsticks which can be used for further research in this area.

As a course leader for the Arabic Page Layout & Design course offered by the Mass Communication Department at Kuwait University and in charge of the Digital Media Lab in the same department, the researcher has a professional interest in computerised design and Arabic typography. The researcher is particularly interested in the question of the integration of computers within the design process of Arabic publications. The main purpose of investigating the computer's impact

on Arabic design, as well as investigating the adaptive and adoptive behaviour of the people involved in the process, is to determine the necessary changes wrought by this phenomenon, in teaching, training, and working methods in Kuwait. The researcher has capitalised on his access to design classes, by working with a combination of Arabic graphic design students, and experienced Arabic printing professionals.

Structure of the Thesis

This thesis is divided into a further ten chapters. Following is a brief overview of the structure of the thesis as it emerges from the approach outlined above:

Chapter Two explores the dynamics which have characterised the transformation and restructuring of the graphic arts industries. It explains the essential aspects of digital prepress and how it differs from conventional techniques. The nature of the computer as a design tool is carefully examined.

Chapter Three addresses contributions focusing on the macro aspects of technological change and the labour process, as well as on concepts suggested for the more specific analysis of work, work organisation and work environments. It focuses on the roles and skills needed in the so-called traditional prepress systems and computer integrated prepress systems.

Chapter Four provides the contextual framework in which this study is located. It discusses the historical developments of Arabic script and typesetting. The genealogy of Arabic typography is traced from calligraphy to computer typesetting. It discusses the connotative and affective values associated with Arabic calligraphic and type styles.

Chapter Five reviews the basic concept underlying the model of the diffusion of innovations and the adoption process. It discusses the concept of innovativeness, or the degree to which an individual is earlier in adopting an innovation, in relation to other members of the social system. It determines the principal variables which influence the adoption of a new technology.

Chapter Six outlines the methodology for pursuing the questions of the study. It involves two survey questionnaires. In addition, a more focused examination of three Arabic magazines is undertaken to determine the impact of computer prepress on the production process, the staff, and ultimately, on the design of magazines. A design analysis of selected publications is also conducted.

Chapter Seven contains an analysis of the nature of Arabic characters in order to make realistic comparisons with the Latin alphabet and develop a suggested 'Arabic Design Instrument' which can then be validated by a panel of experts for testing and analysis of the resultant data. It examines the literature concerned with the canons associated with the elements in a graphic layout. Among these are pertinent recommendations drawn from legibility research and anecdotal accounts given by acknowledged graphic design authorities.

Chapter Eight presents the results of the analysis which is built around the Managers' and Designers' Survey Questionnaires. It discusses the adoption of computer prepress systems by printing managers and determines the factors which influence their decision to adopt the new technology. From this analysis, core themes emerge which speak to the broader meaning of work as a central human activity.

Chapter Nine develops a comprehensive portrait of the changing work place of designers as an introduction to the subsequent analysis of the meaning of technological change for different groups of workers in the industry. It addresses the many facets of the implications of technological change for the individual and collective work experience as it relates to work activities, work environment and social relationships. The discussion relies on the responses to the Designers' Survey Questionnaire.

Chapter Ten provides a descriptive and evaluative analysis of the change in Arabic publication design as a result of the introduction of computer prepress. A new approach to digital graphic design evaluation is given based on the proposition that it is possible to diagnose and report the presence of computer based design defects in a sample and that this diagnosis can be used to identify the same defects in other samples in the same population. It argues that the diagnosis of 'bad design' symptoms can inform design evaluation and indeed is a more rigorous instrument for computer based design evaluation than one which seeks the unequivocal declaration of 'good design'.

Chapter Eleven tries to synthesise the different levels of analysis and interactions resulting in multiple problem definitions. Based on the different aspects which emerge as problematic and the contradictions inherent in recent technological developments, suggestions for alternative approaches will be outlined. The chapter concludes with a set of recommendations based on the findings of this study.

The Research Setting

The printing industry is an economic sector in which far reaching, rapid technological change coincided with a history of effective worker

control over the production process. Therefore, in this section, the reasons for choosing the printing industry as the focus of this research will be discussed.

This research adopts a broader perspective by exploring how technological innovations, relationships of production, and traditional craft ideologies interacted to precipitate the transformation and demise of a traditional craft. These interacting issues are manifested in the changing printing industry in Kuwait which are the main focus in the analysis.

This multi-dimensional approach allows for the surfacing of multiple problem definitions which concurs with Robinson's (1996) proposition, that "a major task of the social scientist lies in foregrounding and criticising the tacit frames which underlie problem definitions and which may carry with them consequences we do not intend." This entails working back from action and, thus, discovering what is problematic by eliciting implications of problem definitions for actions. Needless to say, different actors and groups involved in a given problem situation perceive and define the issues differently according to the perception of their interests. Depending on the prevailing problem definition, plans and actions bear the characteristics of a set of presumably agreed upon underlying assumptions.

In this sense, the study is an attempt to challenge the prevailing problem definitions of technological change outlined earlier. Putting the primacy of people's lives into the centre of discussion, this research is based on the view that work is not an inferior part of life, a necessary evil, but a central aspect of human needs fulfilment on whose stage of development social and cultural progress is to be measured

(McLoughlin & Clark, 1992). This implies going beyond a mechanistic, sequential and limited historical view of technological change by creating a picture open to the experiential world of people and, reaching backwards into history, exploring the concrete conditions for action. Thus, rather than studying only the outcome of recent technological change processes, which merely represents a 'slice in time', a developmental approach is proposed which addresses and includes the historical determinants of change. The examination of change has to involve a historical perspective, if theory has to be validated and revised against practice in which social, economic, political and technical changes are the key set of variables (see Lerner, 1956; Pye, 1963; Schramm, 1964; Rogers & Shoemaker, 1971; Salem, 1990).

Why study the demise of a craft, one finally might ask. Why not contribute to the growing literature on workplace humanisation instead? Indeed, this is exactly the contribution this study intends to make. It argues that in order to understand what meaningful work might be requires that we explore what has been lost, or gained, by whom, and why, thus providing a point of departure for recommendations about what is to be reclaimed and developed and what might be the limits as well as the possibilities in this respect.

The Printing Industry in the West

The printing industry is one of the world's largest but least attention-getting industries. It is often referred to as "the barometer of the economy" as it appears to reflect the general economic climate at any time — in other words a buoyant printing industry often reflects a buoyant economy and vice versa (Speirs, 1992). In the Western hemisphere and the Far East, a total of almost six million people are

employed by the printing industry. The size of the United Kingdom domestic printing industry is impressive. The British Printing Industries Federation (BPIF), an industry trade and resource organisation, lists the following statistics. The printing industry is the UK's sixth largest industry and employs 160,000 people (outside newspaper printing) in 10,000 companies which are spread throughout the UK. The printing industry in the UK serves all parts of the economy including central and local government, financial services, distribution, travel and tourism, manufacturing industry, and agriculture. Demand for its product is essentially derived from the level of activity in the economy at large and although proportionately little of its output is sold directly for personal use, consumers' expenditure has a significant influence on the health of the industry. As a nation there is an amount of approximately £85 spent annually for every man, woman, and child in the UK, on books, magazines, and newspapers. The value of sales in the industry is £8.6 billion per year (British Printing Industries Federation, 1994).

According to Printing Industries of America (PIA), there are 46,000 printing establishments in the United States with 900,000 employees. It is 350,000 employees larger than the computer industry, 300,000 larger than the airlines, and 500,000 workers larger than the steel industry. The PIA figures above do not include publishing, photocopying, and duplicating. When these areas are included, the number of establishments jumps to 63,000 firms and of employees to 1.7 million persons. This would make the printing industry first in the number of establishments and the sixth largest employer in the United States (Printing Industries of America, 1992).

The Democratisation of the Craft Guild

Printing, as described above, was a guild populated by highly skilled specialists. These specialised people practiced a difficult and obscure craft in a rarefied atmosphere outside the understanding of normal people. Unless a person was part of the industry, communication with the industry was very difficult. A different language was spoken: picas and points, leading, kerning, trapping, guides, Pantone, Matchprints, halftones, line screen, and so on. Many companies, which produced a large amount of printed matter, hired one special person who could communicate with those printers.

Beginning in the mid-1980s, suddenly, all those processes which could only be done in darkrooms or under special lighting by highly skilled masters became accessible to the general public. Predictably, the result was chaos. The industry passed off the new phenomenon as a joke or a passing phase of new entertainment. The new breed assumed that the old masters were 'archaic relics' with no relevance to modern computer prepress.

For a while, desktop computer prepress was ignored by the industry. Everyone lamented the passing of huge industry segments, but the 'ostrich approach was ubiquitous: If we ignore it, it will go away'. Of course, it did not. The economic pressures were too great. An economy based on marketing cannot ignore a technology which requires yearly upgrades. Digital production is a marketer's dream come true. Every year, upgrades are released which are genuinely needed. Once a person enters the digital arena, he or she is at the mercy of marketing pressures (Bergsland, 1997). Moreover, users are keen to adopt desktop methods because of time saving, increased quality and faster turnaround.

An Industry In Flux

Graphic arts is the field in which text and image are put together, multiplied and distributed. With the evolution of electronics new media have been created and established but this has also meant new conditions for the printing industry. Radical changes are taking place in the printing industry as microelectronic technologies emerge. The application of microprocessors, lasers, digitisation, and screen-based technologies are among the many innovations which are bringing these changes about. Bruno (1993) emphasised that many graphic arts enterprises have shifted or are in the process of shifting production to a hybrid environment based on computer integrated prepress systems; electronic image processing, digital colour separation, electronic page composition, and advanced type control which have become media of integration bypassing the traditional mechanical stages of production. Changes caused by desktop computer prepress systems have been so dramatic, in fact, that they have resulted in the redefinition of the entire structure of the prepress industry (Bruno, 1993). In summary these changes are:

- Today, graphic arts technology is a field with fast evolution. Technology and production have changed from being mechanical and manual to computer intense and more demanding to handle. Much is happening in prepress, or prepublishing, where more computers and modern information technology are being used to produce originals ready to print and the customers to the printing industry take a larger part of the production themselves. But the more traditional printing and postpress technologies are also being improved with computerised facilities, new materials and new methods. Modern computer communication and international standards reduce the need for geographical proximity of the customer to the printing plant.

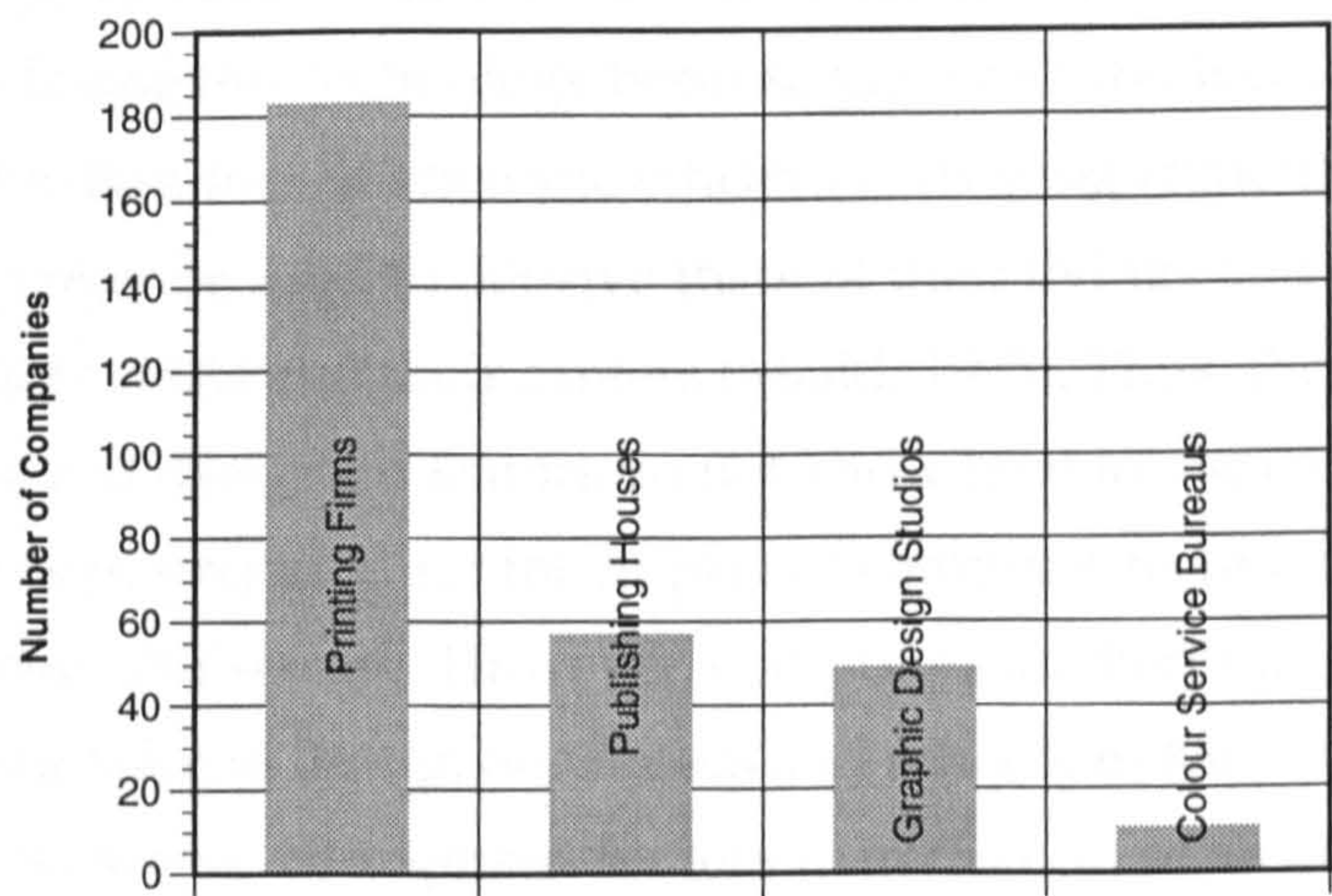
- A number of dramatic technological innovations have since added a great deal of character and dimension to the place of print in culture. Linotype, a method of creating movable type by machine instead of by hand, was introduced in 1884 and marked a significant leap in production speed (Wallis, 1986). The typewriter made the production and 'look' of standardised print much more widely accessible. The process of setting type continued to go through radical transformations with the development of photo-mechanical composition, cathode ray tubes and laser technologies. The Xerox machine made a means of disseminating print documents available to everyone. Word processing transformed editing and contributed dramatic new flexibility to the writing process. Computer printing has already moved through several stages of innovation, from the first daisy-wheel and dot matrix "impact" printers to common use of the non-impact printers: ink-jet, laser, thermal-transfer and dye sublimation.

- Over the years, digital technologies have significantly changed the way the printing industry works. Graphic design, creation of halftone images, trapping, imposition, and proofing — all the steps which take documents to the printing press have been digitised and moved onto the computer. Now the press itself is moving into the digital age, too, making possible certain printing options which were never before imaginable. For example, designers can gain a competitive edge when they present their ideas, in multiple variations, in a high-quality form. Corporations become more efficient with on-demand printing, keeping information fresh, stretching deadlines, and saving warehouse space. Marketers achieve higher response rates when they focus on their audience with personalised mailings. And any ordinary B&W or two-colour document delivers greater impact when presented in full colour.

The Graphic Arts Industries in Kuwait

The political, social, and economic development of Kuwait during its march to progress since independence, has had a positive impact on the printing industry. The graphic arts outlets in Kuwait have become large informational and commercial establishments and are represented by the printing and publishing industries. The commercial printing industry is a very important and expanding part of Kuwait’s economy. A subjective review of the market reveals that there is a continued demand for printing of materials. Kuwait’s press is not confined to the officially licensed newspapers and magazines. There is also a wide range of private magazines published by organisations, establishments, companies, banks, syndicates, and federations. Kuwait now publishes seven daily newspapers (five in Arabic and two in English) and 166 Arabic magazines (Kuwait Chamber of Commerce & Industry, 1995). To cope with the production of this large number of publications, there are 183 printing firms, 57 publishing houses, 49 graphic design studios, and 11 colour service bureaus (Figure 1.1).

Figure 1.1
The Graphic Arts Industries in Kuwait



Source: Kuwait Chamber of Commerce and Industry, 1995

During the past 10 years there has been a 10-fold increase in the number of graphic design studios in Kuwait, and a 10-fold increase in the number of published magazines. There is evidence this trend is continuing to accelerate, driven by an expanding market for information in general, and perhaps the single most important contribution to the growth of small magazine publishers is the rapid development of personal computers, Arabic page layout programs, and desktop laser printers, which collectively have come to be known as desktop computer prepress.

Many professionals in the graphic arts in Kuwait initiated their careers prior to the introduction of microcomputer systems, and many of this number continue to remain ignorant of the potential uses of computer technology. In this professional area, even less is known about software and model development or the simulation capacities of computers. Thus, computer graphics or computer art is a relatively new area of exploration among Kuwaiti artists and designers and within educational institutions. Progress in this area has been slow since the computer has been considered to be a scientific tool rather than an art medium. In addition, many artists and designers in Kuwait have felt reluctant to use this technology because the computer has been reported to be a tool of scientific efficiency, creating anxieties that the computer may be used to deprive them of their livings and negatively impact their crafts and their careers (Majid, 1995). Thus, the majority of designers and design educators do not know how to use computers and have not been prepared for the impact of computer technology upon their careers and society. However, computers are becoming more readily available in design businesses and schools in Kuwait. At present, they may be acquired for less than the cost of an electric typewriter. Because money is no object for a an oil producing country

like Kuwait, the acquisition of microcomputers is presently within the reach of most educational and professional institutions.

The investigative basis for the present study is to show how designers and art educators should be aware of this technology in order to foresee its impact upon their professions. Graphic designers and design educators in Kuwait must be provided with effective and efficient continuing education in order to enhance and maintain their skills. Training for future careers in graphic design within these disciplines will require knowledge of the capabilities of this new technology.

The researcher's principal contention is that the aesthetics of a graphic layout relies on the knowledge of well established principles and observance of their application. Novices who are unaware of these principles are unable to achieve good design in the production of a desktop publication. Thus, many untrained users in Kuwait produce what is referred to as 'laser junk' — documents which are muddled and superficially dressed up with visual tricks and devices characteristics of 'computerised design'. Thus, the researcher believes that because of the dramatically reduced cost of publishing on a desktop, much of the knowledge accumulated over the years and carried on by professional typographers was ignored or had never even been heard of by a significant proportion of those people doing typographic and graphic work in Kuwait.

Chapter 2

TECHNOLOGICAL DEVELOPMENTS IN THE GRAPHIC ARTS INDUSTRIES

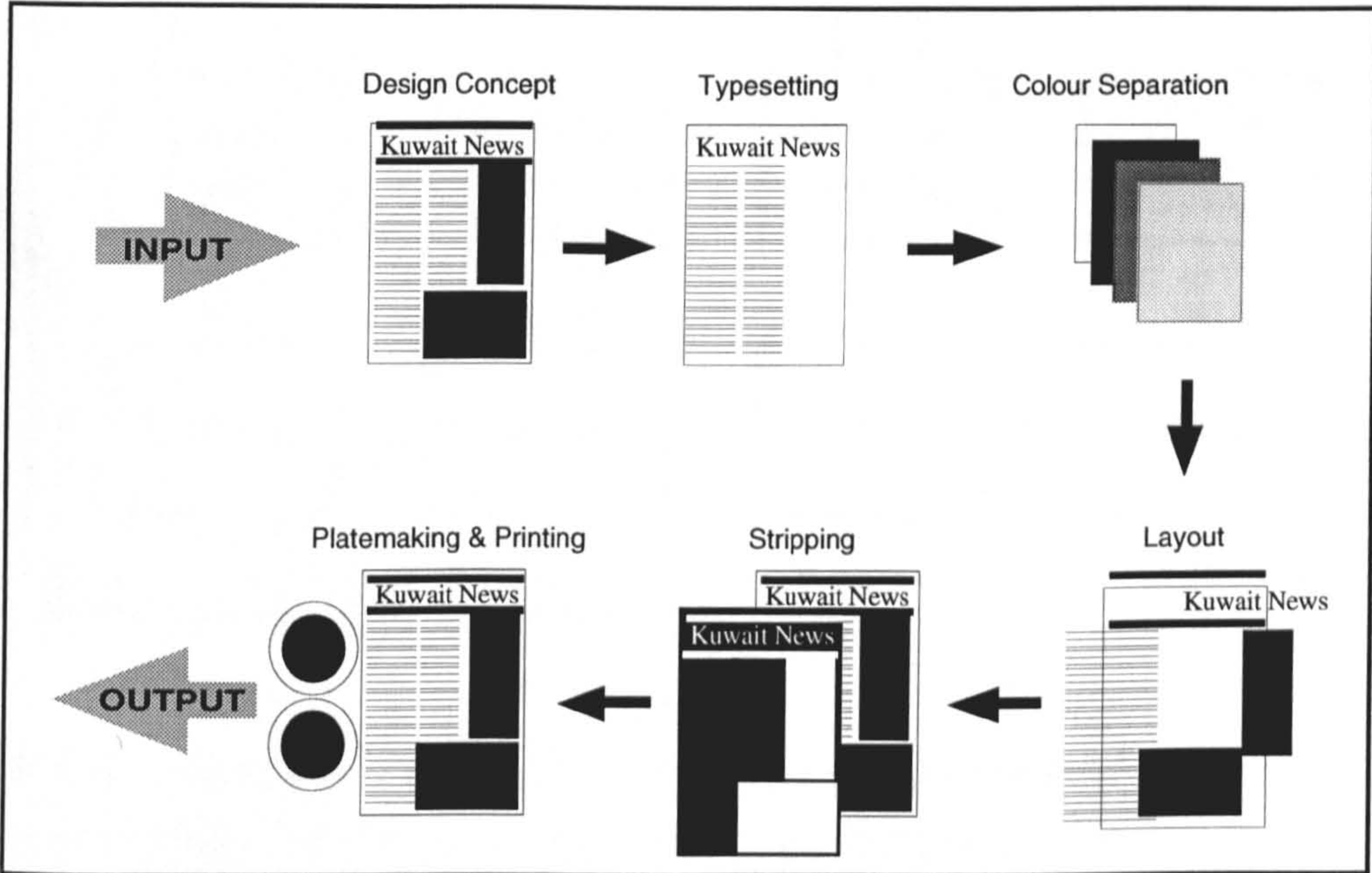
In this chapter I review the literature on technological developments in the graphic arts industries. This is mainly done from the non-Arabic standpoint. The subject of computer technology as a whole has been investigated extensively, and much relevant literature already exists on its applications, impact and users' attitudes toward its roles. This chapter provides a review of literature on computer technology, specifically in the graphic arts industries. The information available is discussed, in order to provide background knowledge and understanding, before going on to consider technology's impact on prepress and printing crafts, the development of Arabic typesetting and the diffusion and adoption of new technologies within this context. While this review cannot address every issue which might arise in digital prepress technology, it should help better understand the changing terrain in this new graphics arts frontier. Because of the evolving nature of this technology, this chapter will only cover the data until 1995.

Printing is the art of making many identical copies of words and pictures. Transfer of the image from the printing surface to paper is called presswork. This, however, is only one of the processes involved in the production of a printed piece. The entire printing function comprises typesetting, platemaking, presswork, and binding (Walker, 1992).

In order to understand the role which computer prepress systems play

in the printing process, it is important to understand the flow of the printing process itself. The printing process follows on from the initial stages of converting the original matter, through to the finished printed form. As a manufacturing system, there are inputs which feed into the process, and outputs of finished, printed goods coming from the system (Figure 2.1).

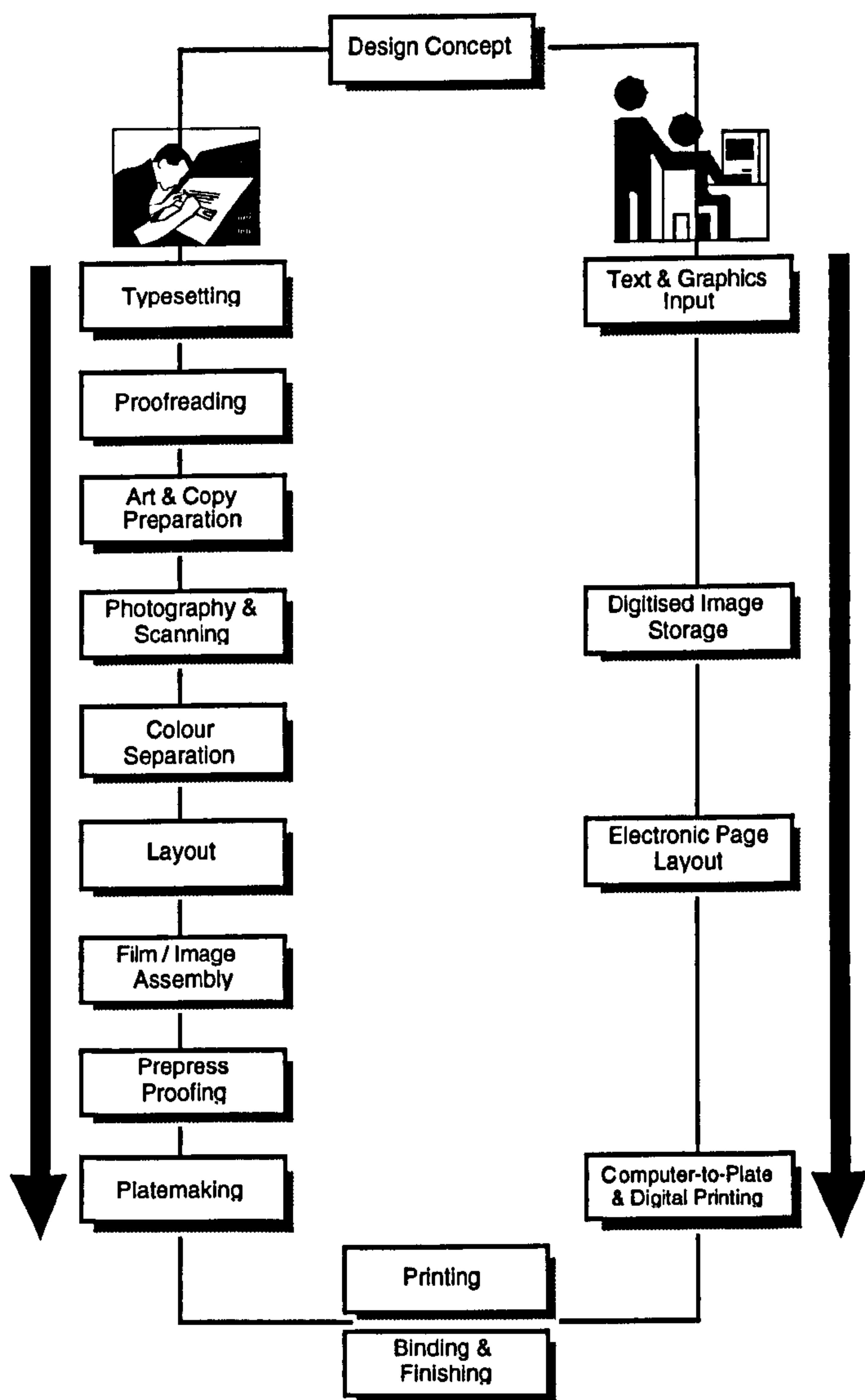
Figure 2.1
The Printing Process



The inputs consist of the images themselves and methods of transferring the images to printing plates for the press. The outputs of the printing process are delivered to the client or consumer and are not fed back into the system. Within the flow of production, however, there are procedures familiar to printers, such as proofreading of manuscript copy, inspection of colour proofs and retouching of films. In the traditional process, all these procedures are necessary. As changes are made in a traditional printed job and exposed onto film, the chances for

Desktop computer prepress processes currently replace part of the traditional system just mentioned. They eliminate manual stripping, and assemble images into final films or plates electronically on a computer monitor, rather than assembling negatives manually on a light table. In a totally digital prepress system, as is possible today for some printing processes, no actual film is produced at all (Figure 2.3).

Figure 2.3
The Prepress Process: Traditional vs. Digital Method



Typographic Technology

Since the invention of type, whether it be credited to Johann Gutenberg in 1450 or to Chinese artisans hundreds of years earlier, someone has had the task of deciding how type was placed on the printed page. The standards of placement are known as typography; or, more specifically, typography is the style, arrangement or appearance of typeset matter. Typographic design has historically been an important part of the production of printed matter.

The invention of mechanical typesetting has been called the beginning of the Industrial Revolution. It is the earliest mechanization of a handicraft: the hand-lettering of books. Typographic design has been closely bound to the evolution of technology, for the capabilities and limitations of typesetting systems have posed constraints upon the design process. At the same time, typesetting has offered creative challenges as designers have sought to explore the limitations of the available systems and to define their aesthetic and communicative potential. From hand composition to today's electronically generated typography, it is important for designers to comprehend the nature and capabilities of typographic technologies, for this understanding provides a basis for a thoughtful blending of design and production (Carter, Day, Meggs, 1993).

In years past, groups of printers and typographers were formed to further and, in some cases, protect from outsiders the tricks of the trade. Printing, typesetting and typography became skilled crafts that took years for apprentices to learn. Type was produced in variously-styled alphabets, some designed for readability, others made for embellishment. At times during the history of typography, new technology was introduced. The invention of movable type itself was new technology, and that innovation startled the keepers of the status quo: those artisans who made their livings and defined their lives by producing manuscript books laboriously and artistically by hand.

Hand composition is the oldest form of typesetting in existence. The process is characterised by the use of individual type characters for each letter of the alphabet. Each character, called a piece of foundry type, is an oblong piece of metal with the letter it represents cast in relief on one end. Hand composition is the manual assembling of these individual type characters into words and sentences.

Machine composition provides a faster means for the setting of type because it takes the handwork out of the typographic function. Seybold, writing in 1979, refers to the four principal hot metal typesetting systems being Linotype, Intertype, Monotype, and Ludlow. All are referred to as hot-metal systems because they do not actually set type, but rather cast type from molten metal.

Cold-type composition is a generic term used to describe a variety of techniques for producing camera-acceptable type matter in other than hot-metal form. The most common of all cold-type typesetting techniques is strike-on, or direct-impression, composition. This typesetting technique uses electric typewriters which strike the type image onto the paper. Another method, photolettering, is based on the use of a disc or strip of film which contains photographic negatives of each letter of the alphabet. These letters are positioned one at a time on photographic paper, and exposed and developed. The result is type matter that can be used as camera-ready copy for display setting.

Phototypesetting is a more complex form of typesetting. It is basically a high-speed photographic process wherein characters are photographically exposed, a single letter at a time, on film or light-sensitive paper. Phototypesetting has continually evolved since its introduction to the market in 1950. The first phototypesetters used

purely mechanical typesetting machines to set photographic type. Later, electromechanical devices produced images of type (characters) on photographic paper; these images could then be enlarged or reduced by means of suitable lenses. Finally, completely electronic typesetting systems were devised. These systems can digitise the images of up to 500 characters per second and display them on a cathode-ray tube (CRT) or, by means of a laser beam, on photographic paper.

Typesetting machines are capable of composition, or page makeup. Front-end systems (composition systems that lay out text ahead of typesetting) compose text and graphics into pages or layouts ready for platemaking. Graphics are input into page-makeup systems by image digitisers such as flat-field scanners. Raster image processing (RIP) is a typesetting technology that can generate both text and graphics at any arbitrary resolution (Wallis, 1986).

The Rise and Fall of Phototypesetting Machines

The invention of the Linotype in 1886 by Ottmar Mergenthaler was a breakthrough in the typesetting craft which increased the capacity of typesetters to produce pages of printed materials. Linotype's success encouraged competition, from such companies as Intertype and Monotype. At the same time, however, the craftsmen who learned the setting of type manually, felt that their livelihoods and craft were threatened by Mergenthaler's invention.

After each level of innovation over the years, a new or altered standard emerged. Craftsmen were retrained or recruited who learned the new technology, and typography and printing was carried on by masters of the new craft. Guilds and unions protected and propagated the work, the conventions and the collective results of hundreds years of the

setting of type.

In the last half of the twentieth century, technological changes in typographic functions and printing increased exponentially. The inventions of so-called strike-on type and phototypesetting, and phototypesetting's various manifestations in the decades from 1950 through the 1980s, brought about a transformation in the technology.

The technology of type went largely unchanged for four hundred years from Gutenberg to Mergenthaler's invention of the Linotype in 1886. For almost a century, Linotypes were built — a total of about one hundred thousand machines were manufactured and lived up to their reputation.

The most far-reaching technological advance in the twentieth century was that embodied in the computer. Typographers and printers, beginning mostly in the 1950s, began making use of computers to set type photographically, and the gradual phasing out of hot-metal processes began.

The institution of offset printing, or lithography, made nonmetal type feasible on a larger scale. A printing plate for the offset process could be prepared photographically and could reproduce any image, whether made by type, a line drawing or calligraphy.

Ottmar Mergenthaler's Linotype was hailed as a 'revolutionary machine' by newspaper publishers. The Linotype was integrated in the newspaper industry, and its introduction brought widespread unemployment among compositors through the mid 1980s. In fact, union attempts to regulate the use of composing machines greatly

increased labour's influence in the graphic arts industry and have had long lasting importance. However, following World War II, the Linotype was found dispensable just as previous technologies had been. The Monotype machine invented in 1887 then improved in 1897 was a forerunner of modern word processing. The invention of the teletypesetter in 1928 allowed copy to be transmitted over wire or airwaves and then it became a standard for newspaper and publication typesetting by 1900. In the 1950s the phototypesetter was introduced, and its use rapidly became widespread before the advent of computerised typesetting technology in the late 1960s (Bann, 1994).

Other elements responsible for the most recent changes in the graphic arts industry include computers, microprocessors, lasers, digitisation of information, television, screen-based technology, and the telecommunications revolution. Many graphic arts companies have adopted computer printing technologies, such as cathode ray tube (CRT) typesetting, laser typesetting, and teletypesetter systems. This trend represents a dramatic advancement over previous technology.

Typefaces have been used in the West for over five hundred years during which time an enormous number have been designed. Originally, the tools and processes used to make these fonts were complex and expensive. Today, typesetting machines are much less expensive due to the introduction of computerised typesetting. The key tool in creating screen based typeface images can be said to have been the cathode ray tube (CRT), which is used in video display terminals (VDTs). VDTs were introduced to many daily newspapers during the mid-1970s (Barlow & Eccles, 1992).

Photocomposition

The introduction of photocomposition has been described as the third major development, following movable type and hot metal casting, to change the structure of the printing industry. Photocomposition involves the transfer of optical characters from a negative master onto a photographic emulsion. Provision must be made for proper illumination, image formation, magnification or reduction, and positioning of each image. Typographic quality output is achieved in photocomposition by automatic selection of the right one of a relatively large sets of characters, by controlled positioning, and by the insertion of special symbols and characters.

The development of each photocomposition generation permitted the setting of an ever increasing range of copy. The first generation was used to typeset copy which had relatively standard formats, type, styles and sizes. The second and third generations of typesetting were successively able to set copy which required a greater variability in format, style and size. The standard format permitted large dailies to be the first segment of the printing industry to use digital computers as production tools. By 1964, computers for newspaper typesetting had already become commonplace. The application of photocomposition to advertising and book copy was, however, still in its infancy. The first generation of phototypesetters adapted hot metal casting to set type and compose copy. The second generation machines were specially conceived and designed to set type by photographic means. The third generation typesetter does not expose type directly to photographic masters but rather reproduces them electronically on the face of a cathode ray tube, a device similar to a TV screen. The images thus created are photographed directly from the face of the machine.

Cathode Ray Tube Typesetting (CRT)

The photographic principle of flashing a light source through a negative image of the required character is abandoned in this design of machine. Instead images are generated on the face of a cathode ray tube (CRT) and exposed from there onto photographic material. Barlow & Eccles (1992) describe a third generation CRT typesetter:

A cathode ray tube crudely resembles a flat-bottomed glass bottle, in which the bottom serves as a screen. This is coated with a phosphor salt which glows (fluoresces) under the impact of high-speed electrons. The electrons are fired as a concentrated beam from a cathode in the neck of the tube, and the light beam appears as a microscopic spot on the screen. The beam can be diverted to move across the screen under the control of electronic data fed to deflector plates between which the beam passes, enabling the beam to 'draw' images on the screen; the phosphor continues to fluoresce for a very short time after the beam has moved past (persistence), and so the image can be redrawn at very high speed to give the appearance of a continuous image. This is then transferred to the photographic material via a lens system or a fibre-optic faceplate.

Depending upon the method of character storage, Seybold (1979) classifies CRT typesetters into two categories. One category creates a character image on the face of the CRT by simultaneously scanning a photographic master. Hence, the 'character store' is to be considered photographic even though the image is not exposed on film by the conventional means of shining a light through it. Instead, the information derived from scanning this photographic master is converted into analogue signals. These, in turn, instruct the deflection circuitry of the CRT where and how to draw or paint the output character.

The alternate approach is to store the characters as a digital

representation instead of as photographic images. Once the digital representation of each character or image is stored in memory, it can be retrieved, duplicated, and reused by many different remotely located typesetters whenever that character is desired.

The primary application of the cathode ray tube technology in the printing industry is found in cathode ray tube typesetters which are designed for large-scale, high speed composition installations (from 400 to 5,000 newspaper text lines per minute). The key advantage of cathode ray tube typesetting is that it can set lines as long as one hundred picas while setting halftone and line art on the same page as the type (Romano, 1980).

Use of the CRT typesetters, both monochrome and colour, increased rapidly after the 1970s. These machines, called fontographers and are widely used in typography, e.g., selecting, arranging, and using type in forms which convey messages and please the eye (Berlow, 1990). The last thirty years has also seen the development of raster output devices in the form of cathode ray tube typesetters which have made advances in laser printers and bit-mapped graphics displays possible.

Laser Typesetting

Not only has typesetting developed greatly with the introduction of the cathode ray tube, but laser systems have led to great advances in graphic imaging as well. The development of laser typesetting has been investigated by several researchers. Barlow & Eccles (1987) analysed the characteristics of high-quality text as resolution was varied in the laser printer system. They explain that laser printers have become popular because of their high quality output. Many controllers for laser printers contain a frame buffer, a memory which stores the value of each pixel

on the page. Printers so equipped can print any combination of black and white pixels. Laser printers typically print about 300 to 600 pixels per inch (dpi). Electronic typesetting systems (ETS) work much like laser printers but at higher resolutions with frequencies greater than 2,000 pixels per inch.

Computer applications in the graphic arts industry have also involved the development of raster output devices in the form of bit-mapped graphics displays, output devices which portray bitmap images. A raster display is a bitmap display in which the bitmap data are scanned line by line.

The word raster comes from TV technology, and refers to the two dimensional array of horizontal scan lines. The operation of the raster graphics terminal is similar to that of a TV set. An electronic beam from an electron gun bombards the inner surface of the CRT, causing the phosphor coating on the CRT to glow (Onwubiko, 1989).

Sugiura (1987) investigated the application of TV images in printing, or video printing, where Hi-Vision offers good image quality even at enlarged sizes, such as those of weekly magazines. He suggested that as software became more widely available, the photographed images and print matter using such paper became printable with similar quality to conventional print.

The works reviewed above highlight the impact of cathode ray tube and laser systems on the printing business and demonstrate that typesetting techniques have undergone a period of revolutionary change. Publishers as well as typesetting and composition vendors are acquiring or investigating equipment designed to turn out copy faster and qualitatively better more cheaply than ever before.

Teletypesetter Systems (TTS)

Teletypesetter systems are used in news centres and printing houses. These systems involve encoding copy with a keyboard and sending electrical impulses across the land to be formed into paper type at receiving stations. These systems coupled with the use of satellite telecommunications have had direct and important effects on printing industries. For example, computer integrated prepress systems (CIPS) are used to preprocess colour correction by transmission by satellite. Hawkins (1988) reported that beams of prepress production process via satellite now use full colour printing; about twenty percent of colour printing done is by scanning and transmitting text and graphics through satellite.

Computerisation expresses information in terms of the digits 0 and 1. The digital signals can be transmitted by ordinary telephone, by microwave, by radio waves relayed from earth satellites, and by laser beams in air or in optical fibers. Information can thus be transmitted over long distances at the speed of light. Examples of the use of this technology are the international magazines which are composed weekly in their respective headquarters and transmitted by satellite to their printing locations across the country and around the world.

Transmitting information in digital form can be a lengthy process because of the enormous number of digits involved. Data compression is a technology which eliminates redundant information in a picture while leaving enough data to reconstitute the picture at the receiving end. Data compression rates of 8 to 1, 10 to 1, and 20 to 1 have been achieved depending on the amount of detail in the picture (Feldman, 1990).

Computerised technology also had assumed a key role in telecommunication at newspapers. Newspapers now transmit texts and images by satellite. For instance, the Kuwaiti daily newspaper, Al-Watan, now sends news from its offices in London in words and images to its head office in Kuwait via satellite.

Researchers into the uses of satellite telecommunications have concentrated on two subjects: domestic and international telecommunication policy and the economic implications of satellite technology for the telecommunications industry. Teletypesetter systems affect the graphic arts industries especially as computerised typesetting has been used (Conover, 1994).

The Production of Images in the Printing Process

Photographs, illustrations and all other materials to be reproduced in printed form must be photographically converted to film for the platemaking stage of offset production. Cameras used for such photographic conversion include galley cameras, darkroom cameras, and vertical camera enlargers. The film is developed either by hand or by an automatic film processor.

There are three types of camera copy for offset use: line, halftone, and colour. Line copy is similar to the line photoengraving in that it consists of solid lines and areas that contain no tonal gradations. Such material includes reproduction proofs, phototypesetting galleys produced on paper, graphs, pen-and-ink drawings, etc. Halftone copy, on the other hand, is similar to a halftone photoengraving in that the image to be reproduced contains tonal gradations that range from solid black to solid white (Barnard, 1991).

Preparation of line and halftone copy for the camera normally requires production of a 'mechanical', or pasteup. All line copy is pasted on a sheet of heavy paper, in the position in which it is to appear on the final printed sheet. Similar in principle to hot-metal page makeup, this operation results in a pasted-up facsimile of the completed job. This pasteup is then photographed as a single unit.

Following camera exposure of the line-copy pasteup, halftone copy is placed in the camera and the camera is adjusted so that the original will be enlarged or reduced to the size required. Reproduction of halftone copy requires conversion of the original to halftone dots. This is accomplished through use of the halftone screen. Line and halftone negatives are then fitted together, or imposed, so that when exposed to the offset plate and printed, the images will appear in correct position on the printed sheet. The negatives are then taped, or stripped, to a masking sheet, or flat, which becomes the carrier for all the negatives to be used in making an offset plate (Itten, 1973).

Procedure for the reproduction of colour copy is more complicated than that for line and halftone work. This is essentially because colour copy must first be broken down into its three component colours. All colour consists, by the 'subtractive' method of colour formation, of a blend of three colours: yellow, blue (cyan), and red (magenta). To reproduce accurately any given colour, then, it is first necessary to know the exact blend of yellow, blue, and red which each colour contains. This is accomplished by breaking down or separating the original into its three component colour values. Once this is done, it is a relatively simple matter to duplicate its colour values on a sheet of paper by overprinting an identical blend of colours from three separate plates — one for yellow, one for blue, and one for red. A fourth plate, for black, is normally added to increase density ranges and improve detail in

shadow areas. The colour separation process is normally accomplished in a camera; however, there is a more recently introduced technology, electronic colour scanning (Hannaford, 1990).

Separating the original into its component colour parts requires four photographic exposures to be made, each on a different piece of film. The first exposure is made through a red filter, which allows only the cyan, or blue, content of the original to be recorded. The second exposure is made through a green filter, which records only the red, or magenta, content. The third exposure records the yellow content, and is made through a blue filter. The fourth exposure is for black, and consists of three partial exposures, one-through the red filter, one through the green, and one through the blue. The resulting four separation negatives are then used to make four offset plates, one for each colour. When printed in rotation, the plates create a reproduction which precisely duplicates the colour blend of the original.

Electronic colour scanning produces colour separation negatives directly from original colour copy. A scanning lamp projects a beam of light through transparent copy mounted on a drum. The transmitted light is converted by photocells into electrical signals that are fed to a computer. The computer amplifies the signals, determines the amount of ink of each colour needed to reproduce any scanned spot, and uses this information to control a lamp which produces a true image of the original on photographic film (Hannaford, 1990).

Electronic colour scanners were introduced in 1950 to simplify and speed up the operations of colour separation and correction. A colour scanner consists of four main components: a rotating (input) drum on which the original is mounted; a scanning head which separates the

original into red, green, and blue colour signals by means of electronic sensors and filters; a colour analyser consisting of four analogue computers that process the colour signals into the four printing colours (yellow, magenta, cyan, and black), colour-corrected according to preprogrammed instructions; and a rotating drum on which the output film is mounted and exposed by the colour-corrected images for the yellow, magenta, cyan, and black plates. The electronic colour scanner reduces the time of colour separation from more than 4 hours to less than 10 minutes and in most cases eliminates the need for hand corrections.

By 1982 input and output on scanners had been separated into modular units which allowed the two functions to be performed independently. At about the same time digital scanners with VDTs for both colour processing and page layout were introduced.

The New Technology

In the 1980s and 1990s came the personal computer and, on its heels, the inventions which made up what came to be called desktop publishing. Desktop publishing, more so than any of the previous phenomena, made available to anyone who was so inclined an inexpensive way to place type on pages of printed matter. The level of the technology available to desktop publishers had far surpassed, in many respects, the level of technology employed by traditional typographers at the beginning of the availability of desktop publishing.

The digital computer in combination with the high resolution cathode ray tube (CRT) and laser, revolutionised the communications industry. Because digital computers have no mechanical parts and are entirely composed of electronic components, they set and process type at speeds

never thought possible. In addition, the text type from digital typesetters has now been developed to rival the quality of phototype (Carter, Day, Meggs, 1993).

The development of WYSIWYG (What You See Is What You Get) systems began in the 1980s with a variety of proprietary systems. It was not until Adobe's PostScript became an industry standard, that output machines and input systems could begin to offer the generalised desktop publishing systems. Photographic output for type is now challenged by high resolution laser devices that double in resolution every year or two.

Computer Integrated Prepress Systems

As digital imaging continues to develop, many different systems and machines have been invented to perform all or part of the prepress role in graphic communications. Some authors have attempted to categorise these systems. Hutzel (1988) places the machines in three categories: low-end, medium, and high-end systems. The low-end systems are the desktop publishing systems (DTP) or personal computer (PC) based equipment. At the high-end are the full-featured, high-resolution colour electronic prepress systems (CEPS). Everything in between falls in to the medium category.

Desktop Publishing Systems (DTP)

It is said that a pebble placed in the right spot in a stream could change the direction of that stream. Considering that nearly every component in print production has changed recently, it could be argued that the pebble was desktop publishing and the stream was print production (Fenton, 1993).

Seybold (1990) suggests that there have been several waves of change moving through prepress technology during this century, and desktop publishing represents the fourth and most recent wave of revolutionary changes in this area. He suggests the changes caused by desktop publishing have been so dramatic, in fact, that they have resulted in a redefinition of the entire structure of the prepress industry.

Desktop publishing means essentially the application of microcomputers and generalised software in the computerisation of such prepress functions as typesetting, page design and layout, artwork manipulation and camera-ready copy production — all done on a computer system which fits within an office environment. The term itself has been objected to by some as not only inelegant, but actually inaccurate since it does not really enable people to ‘publish’ in the strict sense that publishing also means distribution, promotion, and other ancillary activities. An alternative term, preferred by some, is ‘computer prepress’.

Desktop publishing, which uses computer technology and specialised software to produce graphics and text for documents, has been one of the fastest growing segments of the computer industry since its introduction in the mid-1980s. Today, desktop publishing systems are used world-wide to produce a variety of printed documents, ranging from the simplest brochures to complex, four-colour publications.

The roots of desktop publishing go back to the 1950s and 1960s with the marriage of photocomposition and computers. That first step was an attempt to use typesetting equipment linked with computers to set type; then later the systems were expanded to format or lay out pages, referred to as page make up. Since that time, the use of computer

technology in publishing print materials has developed at a rapidly accelerating pace.

The 1970s saw the emergence of system vendors, services which designed and installed single unified computer editorial systems shaped to the user's specific needs. Atex, for example, was one of these, formed in 1973 as one of the first manufacturers of computerised editorial and advertising production systems for newspapers and magazines. At the centre of the Atex system was the minicomputer, much smaller than the huge mainframes which filled entire rooms, but larger than the microcomputers of today (Markoff, 1991).

These proprietary systems began to lose ground, however, manufacturers were unable to keep up the pace of innovation and new features demanded by publishers, while also maintaining and supporting the computerised publishing systems already in place. Meanwhile, system developers were working quietly on the future of computers in publishing, and a series of concepts were brought together to help define a new type of desktop computer system, i.e. Knuth's (1986) system for alphabet design (discussed later in chapter 4).

Thus, computers were already accepted in publishing when microcomputers were introduced in the late 1970s. These microsystems made possible personal computers which could sit on just about anybody's desk. Personal computers became a commodity within practical economic reach of the mass market. By the end of the 1970s the stage for desktop publishing was set. There existed the concept as well as a history of the implementation of computers in publishing, and there were small computer systems which were growing more and more affordable to a wider market.

In the early 1980s, Adobe Systems created a page description language called PostScript and a processor that could interpret PostScript programs and generate a data stream to drive a digital printing device such as a laser printer or film writer. (Wilson-Davies & Barnard, 1991)

The first publishing application to generate PostScript page descriptions was PageMaker, developed by Aldus, a software company named after the 16th-century Venetian book printer, Aldus Manutius. (Aldus became part of Adobe in a friendly takeover in 1993). The first PostScript printer was the Apple LaserWriter 300 dpi monochrome laser printer. These products, along with the Macintosh computer, launched the desktop publishing revolution. PostScript began to have a profound impact on the printing industry with the introduction of the first high resolution PostScript film writer, the Linotype L-300. PostScript page descriptions could be sent directly from a Macintosh to the film writer to produce graphic arts films at a maximum resolution of 2,540 dpi. This was sufficient for high-resolution rendering of text, line art, and halftones.

The computer that did most to launch the microcomputer-based DTP industry was the Apple Macintosh. The introduction of the Apple Macintosh computer in the 1980s was a giant step toward desktop publishing. The Macintosh was developed as a user friendly machine and as part of an integrated hardware and software system. In fact the term desktop came into use also in 1984, about the same time as the creation of Aldus Corporation by Paul Brainard. Aldus was formed as the basis for developing a program that would combine the functions of low-cost microcomputer with a laser printer to produce camera-ready copy. The result was a program called PageMaker which was marketed as a desktop publishing program (Kleper, 1996).

Although other text and drawing programs were available for the Macintosh, PageMaker was the first program which allowed the easy integration of text and graphics into a single document. It also provided the interface for printing out documents on Apple's new LaserWriter, which used technology similar to photocopiers to produce printed materials far advanced in quality from the dot-matrix printers of the time.

At the time, most documents were prepared for printing using the 'cut and paste' method. Text was input into typesetters, which used photo devices primarily to produce galleys. The galleys were then cut apart and pasted onto pre-formatted layout boards, which also contained any graphics or photos that were to be included in the document. When completed, these boards, now called 'camera-ready' artwork, would be sent to a composing room, where they would go through several more steps to produce the final printed product.

The combination of a computer and software which allowed users to compose complete documents without cutting and pasting, and a printer which could produce documents that rivalled phototypesetting in quality, revolutionised the graphics and printing industry almost overnight. It eliminated many of the manual steps previously necessary to prepare materials for printing, and allowed for the easy manipulation of both text and graphics when changes were necessary. Although many in the printing industry were sceptical of the new technology at first, it became clear there were compelling advantages to using DTP systems in many situations (White, 1990).

In the years since then, not only are new programs introduced to the market almost every month, but new versions of existing programs as

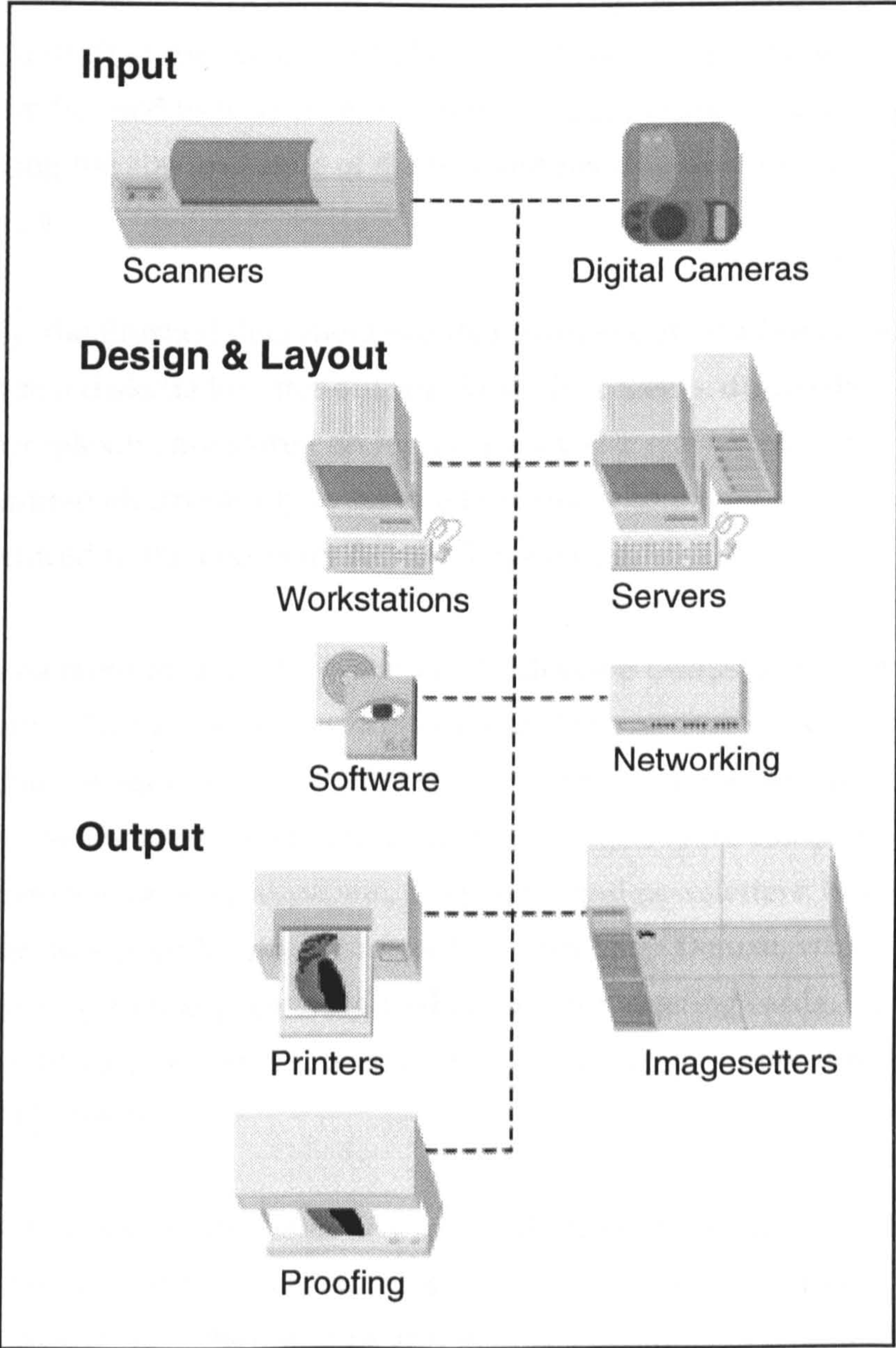
well. In addition to PageMaker, there are other page design programs and programs which permit manipulation of typefaces, alter photographs and draw and paint. Adobe Photoshop, for example, is the world-standard photo design and production tool which provides creative control and increased productivity in editing and creating images for print. The hardware required to run all this software grows increasingly more complex, faster and more powerful (Mirabito, 1994).

The desktop publishing industry is today a huge business — much of it being conducted out of home offices by graphic designers and writers who embraced desktop publishing early on as a viable adjunct to their other skills. Although systems using Apple Macintosh technology still dominate the high-end graphics market, improvements in the Windows operating environment have made personal computers a viable component of many DTP systems as well (Beals, 1997).

DTP Workflow

Producing documents using desktop publishing systems involves multiple steps and various types of software and equipment. The basic components of any DTP system consist of a desktop computer system, printer, word processing software, and publishing software (Figure 2.4) such as CorelDraw, PageMaker or XPress, a system similar to PageMaker developed by Quark in 1987. Although not vital components, most DTP systems also include drawing and photo manipulation programs such as Photoshop, Illustrator or Freehand, and a scanner for reading photos and other art. Some systems may also include video digitising hardware and software as well as electronic pens and graphic tablets for creating illustrations.

Figure 2.4
Desktop Publishing Workflow



These elements are used to create original text and illustrations on the computer, which are then exported to the desktop publishing software. The publishing software then combines the text and graphics into an on-screen display, resembling a document page, which allows the user to see a draft of the finished product. The desktop publishing program also can be used to further refine both text and graphics, including changing the size and style of the text and resizing or manipulating graphics.

Finally, the finished document is either printed out on a laser printer or saved to a diskette for later output. Some documents, due to their size and complexity, are stored on high-capacity storage systems or transmitted electronically to service bureaus, where they are reproduced in the necessary format for printing.

A key element in any DTP system is the desktop publishing software program. They range from simple to complex, and there are programs available for users at any skill level and budget. PageMaker and Quark XPress are the preeminent applications for larger, more complex documents such as newspapers, magazines and newsletters; however, simpler, less complex programs such as PrintShop Deluxe, which feature easy-to-use, pre-configured layouts for greeting cards, banners, flyers and the like, are favoured by many families and other home users (NADTP, 1994).

Some of the necessary features of any DTP program include multiple type sizes and styles — called fonts — as well as the ability to import text, graphics and photographs and to create documents with multiple columns and various formats. Higher-end DTP software allows users to wrap text around odd-shaped graphics, distort text and other elements

to create bold graphics, and produce colour separations for printing. Other desirable features include document templates, which contain pre-formatted layout and typestyle information for a variety of publications; kerning, which allows precise manipulation of type; and on-line spell-checkers and thesauri.

Until fairly recently, there was a distinct difference between application programs for word processing and programs used for desktop design and publishing. However, many word processing programs today include a number of desktop design elements, such as templates, multiple-column layouts, advanced text manipulation and graphics importation, making them useful for producing such items as flyers, brochures and simple newsletters.

Colour Electronic Prepress Systems

Colour electronic prepress systems are specialised computers used for scanning, enhancing, correcting, and colour separating full-colour artwork and photographs. They have become indispensable for producing high-quality colour in publishing, advertising, and packaging. They are referred to as high-end both in terms of their price and performance (Kieran, 1991). High-end colour prepress is comparable to the emerging desktop systems, but with a few differences:

- they are designed to be faster, usually a lot faster
- they have greater resolution and dynamic range, and hence higher quality
- they are more complex to operate
- they can handle larger original output sizes
- they cost more, often a lot more

Faster typesetting and electronic colour scanning not only increased productivity in these two important prepress operations but also

created serious bottlenecks in the stripping operation, where the film is separated into page and plate layouts. Electronic systems (consisting of front-end systems, image processors, and typesetters) for page layout of text with some black-and-white illustrations have been developed.

There are also electronic digital systems (consisting of scanners, image-processing stations, layout tables, and output scanners) for assembling colour illustrations and text. Colour electronic prepress systems are used by some large printing companies and trade shops and are very expensive.

Computer-aided design (CAD) has been used to develop systems to accomplish film assembly, which includes the following operations: laying out the dimensions of the printed page; placement of register marks, page numbers, running heads, and so on; and the handling of image elements, breaks for colour, crossovers, and other positional features. When the layouts are made on film or cut out on mask sheets, the film image elements are attached to the working sheets, or plate flats. Interfaces between these layout systems and the CEPS have been developed. A stripping machine has been devised which automatically applies the film image elements to the stripping flats according to digital data taken from the layout (Bann, 1994).

In the past decade, the market for high-end professional colour systems has been shared primarily by four companies: Hell, Scitex, Crosfield, and Screen (Table 2.1). Their customers have been the 'colour houses' — also known as repro houses, film houses, colour separators, or trade shops — where photographs are scanned, combined with page layouts, and colour separated.

Table 2.1
Colour Electronic Prepress Systems & Manufacturers

System Manufacturer	System Name	Country of Origin	Other Notes
Hell Graphic Systems	ChromaCom 1000 ChromaCom 2000	Germany	Part of the Linotype Company
Crosfield Electronics	Lightspeed StudioLink	UK	Division of Dupont Imaging Systems
Scitex	Star Prisma Visionary Response	Israel	Developed links to the Desktop
Screen	Sigmagraph 2800	Japan	Formerly Dainippon Screen.
Eastman Kodak	Prophecy	USA	Mid-range systems
Agfa	PIX Catalyst	Germany	Mid-range systems
Quantel	PaintBox t	UK	Advanced systems

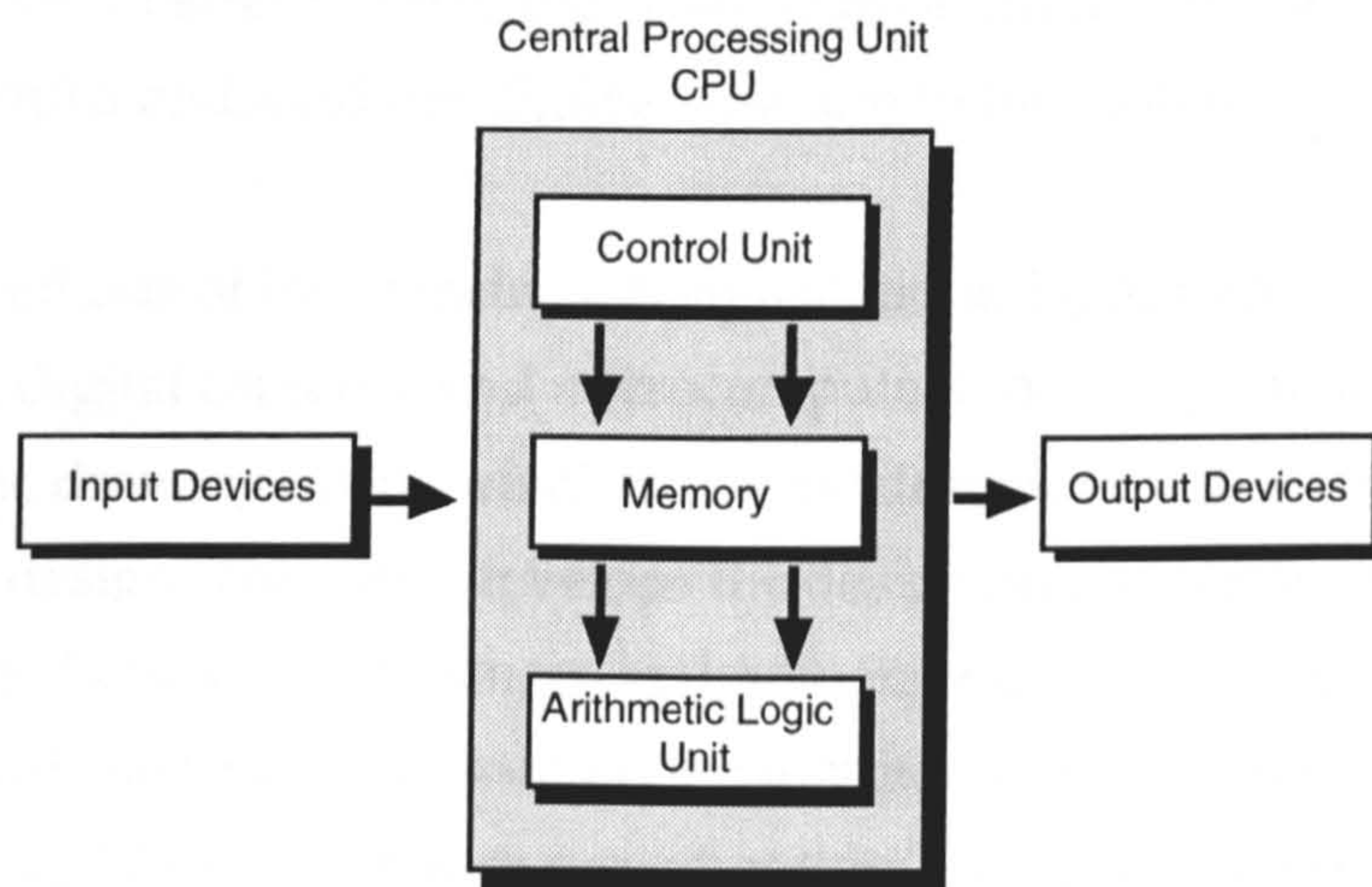
From the beginning of the digital revolution, prepress specialists have been hoping the new technologies would increase productivity by eliminating production steps. Desktop and PostScript technologies helped by allowing the output of both halftones and typesetting on final film. The next step may be the elimination of films and plates themselves. Eliminating steps in the printing process — whether proofs, films, or platemaking — has been the focus of intense activity in the past several years (Wallis, 1995).

Components of Computer Integrated Prepress Systems

While CIPS replace one or more steps of the traditional flow of the printing production process, CIPS must be looked upon as systems in themselves as the name implies. Variations will abound within and among manufacturers' models, but all CIPS contain the same basic components. Because the systems are computer-based, they have the same general hardware as any other computer: a source of input to

digitise information, a memory to store data, a central processing unit (CPU) to manipulate the data, and a place to output the finished work. Figure 2.5 shows a block diagram of this basic system.

Figure 2.5
Major Components of Computer Hardware



The digital computer in combination with the high resolution cathode ray tube (CRT) and laser, revolutionised the communications industry. Because digital computers have no mechanical parts and are entirely composed of electronic components, they set and process text and graphics at speeds never thought possible.

Knowledge of digital-computer functions is critical to an understanding of digital prepress. A digital computer is an electronic device which uses electricity to process information. It can perform repetitive logical and arithmetic operations and store the results of those operations in memory. A computer system is composed of hardware, software, and firmware. Hardware consists of the physical components of a computer; software is the program data which controls the operation of the hardware; firmware is software in hardware form.

Input Devices

Input devices of computer integrated prepress systems provide the system with digitised images of type and illustrations and may also provide the system with instructions about how the design of the page must be made. Electronic colour scanners are the most common input devices for illustrations in CIPS. They scan original transparencies or photographs and send the digitised picture to the system.

Other methods of input include design stations, layout programming stations, digital cameras, and microcomputers. A design station is an electronic drawing board which a graphic designer can use to create the product design. The artist develops the design on a monitor instead of with pencil and paper. Changes and refinements in the design can be easily made and instantly seen on the monitor, allowing the artist to try many more ideas in a shorter period of time than would be possible on paper. Once a design is completed, the electronic image is input to the CIPS. With a design station, much of the basic layout information about the job is provided electronically to the printer, saving production time. Layout programming stations are electronic keyboards and monitors which are dedicated to entering page geometry information of a job into the system if a design station has not been used to create the design of the job. Page geometry includes things like page size, margins, size and location of borders and rules, locations and sizes of photographs, values of solid and tinted areas of colour, and standard printer's devices like register marks, trim marks, and centrelines of the job.

Digital cameras are now on the market as input devices for colour pictures. A special video camera captures an image and sends it to another computer which digitises the scene. Some overall manipulation of colour can be done with the computer before the image is sent on to

the CIPS. A camera like this would eliminate the need for conventional photography and original transparencies or photographs of a colour image. Many variables in the photographic process would be eliminated as well as the need for film and chemistry (Creative Magazines Ltd., 1994).

The most talked-about method of inputting page information into a CIPS involves the use of microcomputers. A 1993 report by the Technical Association of the Graphic Arts reveals that the desktop-to-prepress image design is the fastest growing market segment in colour. According to the report the Apple Macintosh is the computer of choice. These small but relatively powerful desktop computer systems can design pages, set type, and provide the CIPS with the framework to complete the job. Like a layout programmer, the microcomputer is only capable of defining basic page geometry for the CIPS. The actual production scanning, digitising, and colour manipulation of the original photographs and other images in high resolution still must be done by the CIPS. The International Prepress Association lists four shortcomings of doing colour on desktop equipment:

- It is difficult to translate red, green, and blue colour values on the computer display screen to the cyan, magenta, yellow, and black values needed for colour printing
- Colour calibration of monitors is unreliable
- Low-and colour scanners lack the input resolution necessary to produce high-quality colour
- Desktop systems lack the ability to do precise screening for high-quality colour separation.

At the present time, popular stand-alone microcomputer-based systems are limited to text and basic layout production. Processing of high-

quality colour photographs and drawings is still beyond the reach of the desktop world for the immediate future. There is a growing market for what is becoming known as 'pleasing colour' or 'good-enough colour'. This is full-colour printing which has noticeably less fidelity to the original image but is acceptable for less critical applications. Some desktop systems are now capable of producing pleasing colour. Success with high-quality colour using a desktop system comes only when such a system is interfaced with a full-featured CIPS. The Crosfield Studio colour electronic prepress system can receive data from the Macintosh through a hardware and software interface package called StudioLink. Scitex system users also have an interface to the Macintosh. Their gateway uses special page make-up programs based on the commercially available Quark XPress. Hell Graphic Systems is offering a desktop-to-prepress package called ScriptMaster. The basic page make-up programs for these links, and many others for prepress work, such as PageMaker, Quark XPress, and Letraset Design Studio and Ready-Set-Go, use a data format called PostScript. This data format, also known as a page-description language is used by most laser printers and many laser imagesetters.

PostScript is a page description language optimised for printing graphics and text on paper, film, or CRT. It was introduced by Adobe in 1985 which first appeared in the Apple LaserWriter. The main purpose of PostScript was to provide a convenient language in which to describe images in a device independent manner. This device independence means that the image is described without reference to any specific device features (e.g. printer resolution) so that the same description could be used on any PostScript printer without modification. Writing in 1990, Kunkel identified that PostScript would become the standard page-description language, and any new hardware or software will

probably need to follow the PostScript format to be commercially viable. Subsequent developments have confirmed his prediction.

An arrangement connecting a Macintosh or other desktop system with a CIPS gives designers with microcomputers access to an array of expensive and sophisticated equipment for the production of their design ideas. This equipment also allows them to have more control of their designs throughout more steps of the reproduction process than ever before. While Kunkel (1990) states that a number of leading prepress facilities are taking advantage of this and are interfacing their text and graphics producing computers to CIPS, success is not universal. According to Arabic language CIPS users during discussions at the 1993 IPEX trade show at Birmingham, relatively few colour separators in the Arab world were using input from customers' microcomputers on a day-to-day basis (Graphic Arts Seminar Series, 1993). Data transfer from one system to another was the biggest problem. As this study will show very few designers in the graphic arts industry in Kuwait are using the computer as an integral part of their businesses.

The first generation of PostScript technology was not designed for colour printing and was especially deficient when used for reproducing process colour images. The algorithms that were used to convert continuous tone images into screened halftones for print applications were adequate for grayscale reproductions, but not for colour. This did not stop early application developers from enabling their software to use PostScript to produce colour separation films. The quality of the separations was poor, and PostScript technology was relegated to low-end applications where any colour was considered a step up (Kunkel, 1990).

Memory

Once the images have been digitised, they may be stored for the CIPS in several different ways, depending upon the present status of that particular job in the system (DuPont, 1994). The most active memory on the CIPS is called the system scratchpad. The scratchpad makes use of rigid hard disc drives to store the images which are presently being manipulated on the system. Several drives and disc packs are needed to provide and store all of the parts of a job as quickly as the system and the operator need them. The second type of storage for a CIPS holds work in progress. Work in progress is jobs which are in process, although not being worked upon at the time, and are standing by for various reasons. Hard disc packs may be used as well as reel-to-reel magnetic tape. Archival storage is the third category of memory for a CIPS. These are finished jobs being kept for future use or revisions and are most commonly recorded on reel-to-reel magnetic tape.

For CIPS, the amount of memory needed to store a digitised image is much greater than the vast majority of computer applications in business and industry. For example, a single A4 colour page will consume approximately 50 million bytes of information (DuPont Printing & Publishing, 1994). It would take over sixty 3.5 inch floppy discs (the kind commonly used with microcomputers) to hold the same page. Floppies work great in the office, but they are virtually unusable in printing except to move single small documents or text around.

The amount of information which can be stored on an optical disc is far more than conventional floppy discs. These drives use the same technology as audio CDs. There are several major advantages with optical drives: size, permanence and portability. For this reason they are used for encyclopedias, dictionaries, and other large documents. They

also work well for clip art storage. In fact, CDs are the primary source of clip art. The original optical drives were CD-ROM (read only memory). They work well for storage, but they cannot be used for backup because they cannot be written on. The original CD-ROMs were almost as slow as floppy drives. They now have double, triple, quad, and hex speed drives with access times approaching 20 milliseconds. They are still slow, but they are reaching tolerable speed. The expected DVD standard (digital video disk) should solve the problem. They will hold up to 4 GB at much faster speeds.

Because of these vast memory requirements, most experts feel that the future medium of image storage will be cartridge drives: SyQuest, Bernoulli, ZIP, JAZ, removable optical, floptical, and tape drives. All are basically fast floppies holding incredible amounts of data. The optical variants are much more permanent digitally. Bernoulli, ZIP, and JAZ are more durable physically. SyQuests are portable hard drive cartridges. They come in 5.25 inch (44 MB, 88 MB, and 200 MB) or 3.5 inch (100 MB or 270 MB). Bernoullis are 5.25 inch (35 MB, 90 MB or 230 MB). Removable opticals are CD-sized: 600 MB, 1.3 GB, and 2.6 GB. Flopticals are a hybrid - magnetic information on an optical medium. They are the same size as a floppy and hold 128 MB. There are also optical juke boxes that can handle almost a half a terabyte of data. As a result, optical storage is taking over

A more recent standard is the ZIP and JAZ drives from Iomega. ZIPs are 100 MB and JAZs are 1 GB or 2 GB. They are still a little slow, but the capacity is up to multiple gigabytes and they are very permanent. That should keep the prepress industry going for a couple years anyway.

Central Processing Devices

The most visible and glamorous component of a computer integrated prepress system is the page makeup station. The central processing unit of the system, one or more mainframe-type computers, resides here. This is where the actual manipulation of images takes place. An operator sits at a desk equipped with one or more keyboards, keypads, a mouse, a digitising pen or trackball, and at least two computer monitors (Mortimer, 1994).

A Central Processing Unit (CPU) consists of three interdependent components: arithmetic-logic unit (ALU), main memory, and control unit. These three components work together to control the operations of the computer. The ALU performs both arithmetic and logical functions such as adding two numbers together and determining which of two numbers is the greatest. In the main memory, called the random access memory (RAM), data is stored and retrieved by the control unit. This unit also governs the functions of ALU and RAM. Consisting of these three parts, the CPU is the brain of a computer. It controls all functions, including the generation and setting of type in a digital-typesetting system.

A digital-computer system is based on the biconditional state of electronic circuitry. An electronic line can exist in only one of two states: it is either on or off. Each on/off state represents one binary digit or bit, enabling a computer to operate within the laws of the binary-number system. The binary system is a base-2 numbering system using only two numbers, 0 and 1. These numbers coincide with the biconditionals: off and on, respectively. The binary system is the exclusive language of any digital computer (Bann, 1994).

A computer communicates and processes information through the use of data structures. These are bits that have been grouped together into various configurations large enough to store significant information. The smallest bit structure is a byte, which consists of a group of bits linked together, such as the ASCII code (American Standard Code for Information Interchange, an information code in which the numbers zero to one hundred twenty-seven represent alphanumeric characters on the keyboard). These data structures are binary codes representing characters or numbers. Translating the alphanumeric characters into the binary system enables computers and people to communicate.

Page composition is an area that was given early attention by desktop technology because it became apparent that this was the main application the graphic arts industry wanted most (Vince, 1992). Electronic page composition has eliminated the need for labour-intensive and craft-oriented tasks of many graphic design studios. One of the most tedious jobs the designer performs is 'keylining' a piece. Keylining is the process in which the type and artwork are pasted to a board, colours are separated by 'cutting' overlays, and instructions are provided for the printer. Desktop computer prepress workstations have been extremely beneficial in assisting the designer in completing this task. The conventional 'paste-up' or 'mechanical' artist is on the way out and 'x-acto knives' and 'waxers' are replaced with computer tools in which the designer can move the elements around and alter the size and position of the image. A monitor shows in full colour what the actual page will look like. When completed, the page can be output fully 'keylined'. The designer can create an electronic 'comp' for the planned design on a computer, often in much less time than using traditional methods. Design alternatives can be created and changes can be easily made by altering the original. This saves time and minimises

the amount of material handling. Last minute changes are less expensive and often much easier to accomplish.

Calling the digitised images from the system scratchpad onto a high resolution colour monitor, the operator can execute a multitude of possible functions to assemble a final page to the customer's specifications. The other computer monitor lists a running record of the operations which have been performed. The mouse, or other pointing devices, selects parts of the image to manipulate and can select different functions from menus in the software. What was traditionally done on a glass-topped light table with tape, paint brushes, film, and razor blades is now accomplished at the digital work station. All of the high-end CIPS can perform most or all of the following functions (Richmond, 1990). Page size, spaces and shapes for photographs, borders and rules, shading or tinted areas, colours of type and lines can be entered at the page makeup station. This is called page layout and geometry. Once these general aspects of the page have been established, the scanned photographs are called into the layout.

In much the same way that different audio tracks for a sound recording are made separately and then edited together in a recording studio to produce a finished musical piece, a CIPS combines visual images. Photographs which have been shot in different locations at different times can be combined into a single picture. Multiple products for catalogue pages are moved onto one page or into one illustration. Type can be moved around and over illustrations (Austin, 1991).

For textiles, wall coverings, floor coverings, wrapping paper or any application where repeating patterns make up the image, the system can duplicate a single or multiple group of patterns and position them

across and around an entire page or plate without any hint of a seam or gap between them. This is called step and repeat. Small packages or labels which must be printed in multiples to make most efficient use of the size of the printing press are stepped and repeated by the CIPS for a plate or cylinder.

There are several ways a CIPS can retouch images. Overall colour tones of a photograph or page can be adjusted by changing the values of the cyan, magenta, yellow, and black pixels which will make up the final printed image. Selective colour correction can be done to modify only one shade of colour in the picture or just one item in the picture.

Airbrush functions can provide subtle additions or deletions to parts of images. One function which is very valuable for retouching of images is called cloning. Here, one small area of the photograph is copied and duplicated onto another area of the picture. Some common uses of cloning are to remove scratches or dirt from the original photograph, or to extend backgrounds, sides, or foregrounds so the photograph will fill the entire frame area allotted for it in the page layout. In addition, unwanted items or distracting elements in a scene could be removed (Coyne, 1992).

The system can also change the size of an image and rotate images on a page. These two functions take an enormous amount of computer time to complete. However, 300 MHz clock speeds are now common.

Recently, Apple Macintosh is offering multiprocessors with 400 and 600 MHz clock speeds, so computer processing time is improved.

Because a CIPS is computer based, the execution of the above functions is controlled by computer software. This provides another advantage for users. Improvements in functions and capabilities can be made with

an update of the system software. Manufacturers are continually revising and expanding what their systems can do by simply rewriting the controlling software. An old system can 'learn new tricks' by being reprogrammed or upgraded, extending the useful life of the hardware to a degree.

Computer generated art has been slow to gain acceptance by the design community. Acquiring large and sophisticated imaging systems used to be very expensive. Today microcomputers offer many of the same features of the sophisticated stand-alone systems, at a fraction of the cost with the ability to achieve in one operation manipulations that previously took a high degree of craft skill, hours or days to do, or were impossible to do. The most creative phase of the design process is the concept stage. Traditionally, the designer used colourful markers on tracing papers to present his or her ideas to the client. These were the standard tools of the profession because they allow for subtle to significant reworking of the concept. A microcomputer, used as an electronic sketch pad, is an inviting alternative to markers and tracing papers. The computer can be programmed to perform an array of visually exciting manipulations once the image has been input. For example, a designer can magnify portions of the image, choose from a palette of millions of colours, paint with a limitless number of different brush strokes, apply airbrush techniques, create masking and silhouetting techniques, move selected parts of the image, and rotate and distort the image, and so on. Furthermore, a pressure-sensitive tablet linked to the computer enables the artist to translate pressure of the brush by which he or she can control colour intensity, jitteriness, and the degree to which a colour bleeds into the fabric of the canvas. The images can be saved to disk and then retrieved for viewing, reworking, or hardcopy output. Models for packaging graphics and

other three-dimensional concepts such as exhibits, costumes, product prototypes can be built. Once all the points have been visually or mathematically entered, the image can be moved, sized, rotated, and even drawn upon (Garnett, 1994).

Output Devices

Once the image has been assembled on the page makeup station, it must be output so that proofs and plates may be made for printing. The most common method of output is to send the completed pages to a device called a film recorder or an imagesetter. The imagesetter receives the finished digital image from the CPU and instructs a laser to expose full-size negatives or positives of the image. These films are first used to make a proof. If the customer approves the proof, printing plates will be made from the same films. If changes are needed, a decision is made by CIPS personnel whether or not to make the corrections using the system or to make the corrections by hand on the films. Minor changes are often cheaper to accomplish by hand. A second proof may then be made from the corrected films and again checked by the customer. When approval for the job is given, the films go to the platemaking department.

Alternative methods for output are also under development. Because of the time and expense required to make proofs from films generated by an imagesetter, several system manufacturers are developing proofs called hard copy digital proofs. These are full-colour proofs on paper that are made directly from the digital data in the CIPS. No negatives or positives need to be recorded first. Second, third, fourth or more proofs can be quickly made with no film used or wasted. When the digital proof receives approval, only then is a set of final film recorded and used for platemaking. Various digital hardcopy proofing devices are

being developed using dye sublimation, electrostatic, thermal, and ink jet technologies (Cost, 1997). To eliminate proofing material waste completely, a soft proof may be the method of choice in the future. A soft proof is an image on a special colour monitor. No film, paper, or processing are needed. The proofing monitor does not even need to be in the printer's facility. Clients could have a monitor at their office and receive the proof via modem, satellite or other communications line. The 'on line' digital proofing method is, at the present time, being actively developed but is not in wide use. Problems still exist that make conventional film recording and proofing the most economical output method (Bergsland, 1997).

The relatively new Adobe Portable Document Format (PDF) is becoming a standard for layout-driven documents that are intended to be transmitted electronically and viewed or printed at a remote site. The advantage of the Portable Document Format is that all of the design aspects of a document are preserved intact. It is an electronic analogue of paper, with a few additional features such as the ability to add electronic notations and perform simple searches for words and phrases.

Creation of a PDF document is done using a program called a Distiller. This is essentially a PostScript RIP that converts PostScript pages into PDF pages. Documents can be distilled using two different workflows. PDF documents can be written directly from an application such as Word or Quark XPress using a PDF writer in place of a print driver. Alternatively, PDF can be generated by writing a PostScript print file from the page layout or word processing application, then distilling the PostScript file into PDF using the Acrobat Distiller directly. Either way, you end up with an electronic version of the document that can be

viewed or printed using the Acrobat reader.

Although PDF is capable of describing pages with the same design complexity as PostScript, the first few generations of PDF did not support all the graphic features available in PostScript, such as screening information, patterns, the ability to reference external graphic files, and colour separation functions. Future releases of Acrobat will incorporate support for the prepress, personalisation, and finishing operations that are essential in a production printing environment. PDF is a good candidate to become the standard page description format for all documents that are distributed electronically and intended to be printed digitally, because it combines two essential features: document design specificity and document portability.

Beyond page description, the industry needs standard methods of specifying the physical structure of finished products and how those products are to be distributed to their final destinations. This will enable publishers to submit electronic orders to printers and then rely on the printer to take it from there.

Colour Proofing

When the films have been assembled into a layout for platemaking, a proof is made to ensure that the elements, including colours, are correctly placed and also to see what the job will look like when it comes off the press. Proofs are needed to check register, or fit, colour breaks, and crossovers.

Colour proofing of the final corrected image has traditionally been done on proofing presses. Internal proofs for checking the images in-process have been made by off-press colour printing systems. These are

expensive; plates must be made and printed on presses similar to production presses—a slow process. Also, there is no guarantee that a proof made on one press will be identical with a proof made on another, or even on the same press under different printing conditions. In addition, the amount of colour printing is expanding so fast that proofs are needed more quickly than is required to make them on presses.

Most traditional proofing systems are not expected to match the press print exactly. Some use dyes, others use dry pigments; some use plastic bases, others use coated boards; some use multiple layers of images on thin films, others transfer pigment toners to a special base. The main problems have been inconsistency in the proofs and poor understanding and control of the printing processes (Walker, 1992).

There are a number of off-press colour proofing systems which can make consistent proofs in less than one fifth the time needed for press proofs and which match press prints as well, if not better than, press proofs. Systems are being developed that use ink-like imaging materials to make proofs on the printing substrate. Except for magazine advertising, where proofs are sent to customers for approval, off-press colour proofs have largely replaced the traditional press proofs.

Each reproduction process — new film originals, halftone separations, proofs or multimedia displays — relies on different output devices. Each has inherent advantages, limitations and some specific requirements for reproducing images. Fortunately, computers and image software are ideal tools to help users take advantage of the complex range of alternatives.

High-resolution imagesetters use a laser to expose photosensitive film to make cyan, magenta, yellow and black colour separations.

Continuous tone photographs appear on imagesetter film as a mosaic of fine dots called halftones. Newer, stochastic screening techniques are able to render imagesetter halftones with near photographic quality.

Film recorders generate new continuous tone film "originals" from digital files using sensors such as a CRT (Cathode Ray Tube). A film recorder's maximum addressable resolution (a reference to the accurate placement of image pixels) defines output quality.

Continuous tone inkjet printers spray fine drops of CMYK ink through small nozzles to form dots on paper. High resolution models make excellent prints and gallery-quality reproductions on a variety of papers. Dye-sublimation and thermal wax printers transfer colours from RGB, CMY or CMYK ribbons containing dyes or waxes, which are fused onto paper when heated. Dye-sublimation prints are continuous tone in nature, whereas thermal wax printers reduce photos with halftone dots.

Laser printers generate electrical charges with a laser and transfer toner onto paper by fusing it with heat. Images which are output on laser printers, whether colour or B&W, are made up of relatively coarse halftone dots. Computer monitors are very low-resolution (about 72 dpi) output devices. Electron guns focus red, green and blue light proportional to the density of an image onto the back of a phosphor-coated screen. In addition, there are new direct digital colour printing options available. These allow complex pages with images to be sent from computers to special printing presses, without using film or printing plates.

The sheer number of devices and the variables of reproduction can make digital imaging a device-dependent colour process. Reproducing images in publications is further complicated because printing is a subtractive CMYK process, yet computer monitors work by the additive RGB colour theory. Not surprisingly, unpredictable shifts in values are common. Calibration hardware and software can compensate for the way monitors represent colours. Their brightness and contrast values can be improved using gamma correction tools, and white point settings adjusted to simulate lighting found in viewing areas (Bruno, 1992).

A Colour Management System (CMS) helps ensure that images from different sources, such as digital cameras, scanners, Photo CD or video, are reproduced accurately on different output devices. A colour management system characterises the behaviour of each device with a device profile. These profiles are used by the CMS later to ensure that each system component represents colours accurately. By automating the colour process, a CMS helps establish a device-independent colour system.

Colour Management

Since the inception of Colour Electronic Prepress more than five years ago, colour management has been a major problem for everyone involved in production, from photographers, illustrators, and designers to scanner operators, prepress technicians, and commercial printers. Until recently, it has been difficult or impossible to get consistent, predictable colour throughout the design and production process (Francis, 1994).

Colour management systems (CMSs) are an attempt to do for colour

what PostScript has done for printing: to make colour data independent of a particular source or output device, so colour presents the same general impression to the viewer no matter how it is acquired or printed. Just as a PostScript image is limited by the resolution of the output device, colour is limited by the abilities of the input and output equipment, but variations imposed by the production chain are minimised. When all parts of the chain are calibrated and characterised, it becomes theoretically possible to transport colours faithfully and accurately from scanner to monitor to press, with fidelity only limited by the capabilities (gamut, resolution, colour sets of phosphors, dyes, inks and toners, etc.) of the equipment (Agfa Compugraphics, 1993).

The foundation of colour management is a process called 'characterisation', which produces a precise profile of the way that a scanner, monitor or output device records or reproduces colour. The profile describes the ways which the colour data recorded, displayed or output deviates from a reference standard. In a complete CMS environment, an image can be scanned, manipulated on a monitor and printed in colour faithful to the original. This can be achieved even if the operator does not know what output device will be used, or if the various elements in the production chain are remote from one another.

Within this context, a colour-management system (CMS) must do three things. When possible, it should match all the colours in the original image with the colours on-screen, on the proof, and on the final printed page. When a colour cannot be exactly matched, the CMS should map it to the closest alternative, taking into account the designer's intent. And when colours have been mapped, the CMS should provide an on-screen preview so that the designer can take corrective action or at least prevent unpleasant surprises. It is possible today to achieve predictable

colour from initial concept through the final printed piece, thanks to recent innovations which made it possible to exchange colour information accurately across applications and platforms. Colour management software can now ensure that images brought in from a variety of sources are reproduced faithfully. The fruits of the industry's labour around technology and standards for matching artwork to proofs to press sheets are paying off after many years of research, development, and operator training. There is a better understanding of 'RGB' and 'CMYK' relationships today than in the past. While work is still needed in this area, there is an indication that users are beginning to express satisfaction with the progress being made (Computer Art and Design Annual, 1991).

As desktop technology is completely undercutting the pricing for high quality colour work, proofing systems have improved in quality and are producing closer process colour matches to press sheets than ever before. Advertising agencies are using proofing systems for ads in which they electronically transmit the rough concept to the client for viewing and critiquing which proved to be useful in the concept stages of the project.

Digital Photography

Digital photo imaging has brought a new dimension to visual communication. By combining modern digital technology with traditional photography, it has become easier, faster and more cost effective to create work with images — in journalism, publishing, business, and the visual arts. In journalism, daily and weekly publications use digital cameras to ensure faster delivery of photographs from around the world. Studio photographers and their clients are finding new ways to lower the costs of including colour

images in catalogues and advertising. Photo CD systems provide quick access to digital images through online photographic clip art and stock libraries. Technical illustrators routinely use photographs to reproduce cut-away diagrams, a process that once could only be done with drawings. Artists blend drawing, painting and photography to create new and often unique works. Photo labs use computers and film recorders to create new digital originals, or to retouch and restore old photographs which might have been forever lost to the ages. The "electronic darkroom" has brought dramatic changes to photography. Today, photographic businesses replace or supplement traditional darkroom equipment with computers, desktop scanners, image processing software, and output devices such as colour film recorders. In addition, the latest filmless digital cameras have won acclaim for specialised uses (Apple Olympia Expo, 1994).

Through the computer, the world of photography is expanding rapidly, giving the creative mind even more options in the imaging of tomorrow. Digital cameras using disks to capture the image are making rapid inroads into studio photography. Once an image has been digitised, it may be sized, manipulated, retouched, coloured, collaged, and reshaped to the liking of the artist or photographer. Computers are also being used as a controllable light source, the light pixels are individually programmed to imitate the procedure of 'dodging' and 'burning'. Moreover, Photo CD technology is starting to have a dramatic impact on traditional photography and is providing broad access for consumers to have their film images scanned onto disk. Many graphic professionals are rapidly adopting it for publishing and advertising work (Grotta, 1995).

Eastman Kodak entered the compact-disc industry with the Photo CD

System. As originally designed, up to 100 pictures could be transferred to and stored on a disc, as well as developed into slides and prints. A disc could then be played on a compatible CD-ROM drive or, for consumers, on a Photo CD player. The pictures in the latter configuration would subsequently be viewed on a television, and the same could also play audio CDs.

This capability also opens up new creative possibilities. By using the infrastructure which supports the Photo CD System, for example, designers can create their own electronic, disc-based clip art collection from original pictures; store the images on a disc, and load the disc in an appropriate drive. The pictures could subsequently be retrieved and used through various interfaces, much like conventional graphics stored on a hard disc. This system would also be cost-effective since designers would not have to buy the processing equipment. Ultimately, they gain access to another creative tool for desktop publishing, desktop video, and multimedia applications (Apple Olympia Expo, 1994).

Systems such as the Photo CD, for their part, cut across the traditional and silverless photographic fields. Pictures produced as standard prints or slides could also be stored on a disc and viewed on a television. The same pictures could subsequently be manipulated by computer.

Digital Type

Typography is visual engineering, and typographic design is the art of using type effectively. Communicating with type depends on an acute understanding of the basic visual elements — space, shape, form, size, colour, etc. A designer is responsible for choosing and sizing a type style that will enhance the visual concept without compromising the

informational content of the message. As Mike Daines (1993) states so eloquently and concisely:

The main factors which have influenced the development of letterforms — the writing instruments, the surfaces, and materials used for type — are clearly understood and have often been discussed. The advent of digital technology, however, blurred the hitherto well-defined parameters for the design and reproduction of type. It has also developed at such a pace that keeping track of the way in which type design and technology interact has become more complicated. Interestingly, the balance between the effect of technology on design, and way in which type design forces changes in that technology, continues to shift. This interplay is important because contemporary typefaces and typography are spreading their influences more widely through printed communication.

Until the 1980's typeface design was controlled by a small number of type foundries like Linotype and Monotype, the big names from the 'hot-metal' era. Typographical traditions which evolved centuries ago now appear to be under threat from computer prepress technology. The democratisation of type design and font manufacturing has offered the user an incredible variety of fonts. A key milestone in the evolution of digital type is 'PostScript', the page-description language to control imagesetters and laser-printer output (Fraser, 1991). PostScript fonts are defined as 'Bézier' curves, a scalable mathematical outline that can be reproduced at different resolutions and sizes and maintaining a high quality output.

As stated earlier, one of the main reasons PostScript has become so predominant in the computer printing industry is because of its device-independence. Device-independence means that the image (the page to print or display) is defined without any reference to any specific device features (printer resolution, page sizes, etc.). A single page description

can be used on any PostScript-compatible printer from a 300 dpi laser printer to a 3000 dpi imagesetter.

Another powerful aspect of PostScript is that it considers text as just another type of graphics. There is no fundamental difference between characters in a font and any other kind of ink on the page (halftones, line art, etc.). This design aspect provides tremendous flexibility for working with fonts (Felici, 1991).

Most applications which can print to a PostScript printer also can print to a file. Printing to a file means that the application (or the computer running the application, with the help of a PostScript driver) converts the job data to PostScript commands and saves it as a file instead of transmitting the code to a printer. With a PostScript file, the user can download the file to any PostScript printer to print the file.

Downloading is different from printing in that no data conversion (from job data to PostScript) takes place, the file is merely sent to the printer. Most computer platforms have a variety of PostScript downloaders available (Campbell, 1992).

Digital Printing Technologies

The printing industry is rapidly adopting computer-to-plate (CTP) and digital printing technologies which allow electronic documents to be output directly to plate or press. These technologies eliminate the intermediate steps of film output and film assembly, and make it possible to completely automate the printing process. In order for this revolution to be completed, standard data formats that completely and unambiguously specify a finished printed product are necessary. This includes not only page description, but description of all physical attributes of the finished product.

The introduction of PostScript more than a decade ago transformed the way pages were prepared for the press. Today, PostScript and the systems which support it are established standards. This revolution in prepress, combined with breakthroughs in associated digital technology, have led to new methods of output, including digital colour printing systems.

More than simple presses, digital printing systems offer innovative and efficient ways to create and communicate. By eliminating many time-intensive steps from the workflow, digital presses have redefined the printing terms "on-demand" and "short-run." Entire four-colour jobs can be produced within hours, rather than days or weeks. Runs can be a few thousand, a few hundred, or just a few. Materials can be customised to suit different target groups and individuals. And as a result of two byproducts of the digital revolution — high-speed telecommunications and the Internet — documents can be transmitted to multiple locations for distributed printing to meet local needs (Bergsland, 1997).

Digital printing presses combine imaging lasers or LEDs (Light Emitting Diode) with new types of plates, drums, and inks. Models from different vendors, ranging from high speed versions of laser printers to more traditional offset designs, offer a variety of features and printing choices. Not only do digital presses allow documents to be imaged directly on the press itself, but they also automate document management and make-ready, eliminating the time-consuming and costly preparation and calibration of film, plates, and water-based inks. Though not without limitations, these presses provide customers with options that bring professional printing closer to the desktop: quick turnaround, flexibility, and cost-effective four-colour short runs.

An experienced printing firm using a digital press can generally turn around a document run in 48 hours or less, depending on the finishing requirements. Because plates or drums on many digital presses can be reimaged in a short time, last minute changes can be made to the documents while incurring little or no extra cost. Electronic plates and drums also allow clients to customise individual pages while printing, replacing specified images or text, a process known as personalisation. In addition, by transmitting electronic files to other sites, a client can potentially print documents anywhere in the world. This reduces, for example, the effort required to transport thousands of copies. By eliminating much of the traditional press preparation, digital presses make the overall cost of personalised four-colour runs affordable. Though the unit cost of the document may be higher than what clients are used to, the overall cost of the same short run on a traditional press would be prohibitively expensive. However, as some digital presses do not yet produce the rich deep look of material printed on a seven-colour traditional offset press, document designs using four colours should not be overly complicated or dependent on exact colour matching. But these new presses are not intended as replacements; rather, they are meant for the types of jobs that are not possible on their traditional counterparts. Digital presses are ideal for short runs of four-colour work which require quick turnaround and flexibility. In some cases, as with design comps or test marketing pieces, they can produce results that are otherwise unattainable. And if a client needs to customise individual pages the digital printing press is the only practical choice. Digital printing is only just beginning to evolve. The future holds many possibilities, as the technologies of computers, lasers, printing plates, and inks continue to advance.

Future Developments

By the year 2000, prepress, or the process of preparing materials for hard copy printing, will evolve into "pre-publishing," an industry aligned with a variety of hard and soft output options (Laurent, 1992).

As printing techniques move away from such traditional methods as offset, gravure, flexography, and letterpress, prepress is expanding its role into creation and design activities, while readying itself for emerging forms of media. Manipulation of text and graphic elements and page assembly are increasingly a combined activity as it becomes more important to realise the implications of a manipulation process on final page assembly.

The new area of prepublishing will rely heavily on digital technologies. Already, storage and retrieval, once accomplished through mechanicals, film and flat files, are being handled with digital files. The future heralds digital transmission throughout the many stages of the design and prepublication process. The transition to a digital environment will provide suppliers with many opportunities to replace manual operations with automated products and will have a significant effect on the use of specific types of traditional prepress materials.

The effects of these changes on the industry is likely to vary by segment. For example, trade typesetters will have to expand into other areas as the trade typesetting market is declining. Also, commercial printers will be impacted upon by competition from instant printers, and corporations might revert to performing more of their information development, production, and dissemination on an in-house basis.

While prepress organisations have already been impacted upon by high speed laser printers, electronic publishing systems, and colour copiers, they are likely also to diversify outwards, and start to support CD-ROM

publishing, on-line databases, multimedia, and broadcast networks over the coming decade. New colour and multimedia capabilities allow options which have not even been recognised yet. For example, book publishing is likely to radically change. Some will go to on-demand, some to multimedia, some on the World Wide Web, and there will almost certainly be other industry segments in the future (Spring, 1991).

There are several blossoming industry segments that have no counterpart in traditional printing. Digital production is the enabling technology for them. The following industry segments have emerged so far:

Short-Run Colour

This brand-new capability is basically process colour quick print. It has been enabled by digital presses. Process colour used to be the dividing line between normal and top-end commercial printing. The technical requirements were very demanding, the equipment was very expensive, and the labour costs were very high due to the skill levels needed. This has all changed. Colour has been made available to everyone. Digital process colour basically means using a very sophisticated printer on the computer. Digital presses range from process colour laser printers to top-end presses. The presses are hung with blank plates which are laser imaged directly on the press. The result is process printing which is very economical, with shorter turnaround times.

Most printing experts expect this to be one of the fastest growing segments of the printing industry for years to come. With almost all black-ink printing being taken care of by copiers and laser printers, short-run colour will be increasingly in demand. Instead of having

pieces typeset to avoid the typewriter look, people are having pieces printed in colour to avoid the laser printer look. In addition, process colour is so easily done on a computer monitor that designers are often not satisfied with less.

On-Demand Printing

On-demand printing is yet another brand-new capability enabled by digital production. By coupling a powerful computer to a digital press with in-line bindery ability, it is possible to produce custom publications. For instance, there is the prospect of blending data with templates to print customised mailings for an entire list of clients. A million pieces, all personalised, is now more than a theoretical possibility. The possibilities are enormous. Professors can have textbooks custom tailored to their curricula. Catalogue publishers can produce custom publications for specific demographics and even very small targeted groups.

CD-ROM/Multimedia

CD-ROM/Multimedia publishing is increasingly being used by production houses. This area of printing is still in its infancy. The economic pressures are tremendous, however. CDs which can be cheaply produced may contain several full-colour catalogues. For example, one may receive a CD in the mail containing several catalogues from some of the highest quality companies. This single CD cost much less to produce than any of the catalogues individually. The mailing costs are much lower also. Because printers already have the catwalks on disk, CD production is a natural path for them. With CD writing recorders in the low four-figure range, a single person with a personal computer could output a CD catalogue at much less cost than traditional catalogue production (Cotton & Oliver, 1993).

Web Publishing

Both the Internet and interactive multimedia are providing ways of employing the printed word which add new possibilities to print's role in culture. The printed word is now used for real-time social interaction and for individualised navigation through interactive documents. It is difficult to gauge the social and cultural impact of new media without historical distance, but these innovations will most likely prove to signal another major transformation in the use, influence and character of human communication.

Summary

This chapter explained the essential aspects of digital prepress and how it differs from conventional techniques. The graphic arts industries are in a major transformation, a shift to digital technology. The printing industry is passing through a revolutionary phase brought about by digital prepress technology. Productivity, quality and economy are the results of technological innovations with computer integrated prepress systems. These systems heralded the beginning of a new era, allowing all of the elements required for page make-up, typographic finesse, graphics, pagination and style sheets to be prepared on a desktop computer.

Most of the developments described have been directed towards Roman orthography. In chapter four I show that these developments have special, and largely unaddressed problems in Arabic script.

The impact of digital technology on graphic arts industries makes the job itself change. As a result workers' responsibilities may be changed. Printers are realising that they are in the communications business and must embrace changing communications technologies.

The shift to digital technologies is redefining the roles of printers, trade shops, designers and everyone else in the graphic arts, setting off a wave of diversification and integration. The next chapter reviews the influence of new technologies upon prepress and printing industry craftsmen.

Chapter 3

TECHNOLOGY'S IMPACT ON PRINTING CRAFTS

This chapter describes the influence of new technologies upon prepress and printing industry craftsmen. The review of related literature discusses three major points. First, it identifies the components of skill and reviews the relation of technology and craft skill. Second, it traces the historical transformation from craft production to automated prepress production in the two major functions of composition and preparation. Finally, this chapter reviews the transformation the graphic designer makes from the use of traditional tools to those made available through the emergence of computer hardware and its supporting software. Other vital aspects of transition, such as the blurring of roles, and education and training are also addressed.

Components of Skill

In order to examine the process of changing skill for a given occupation, we must be explicit about what we mean by 'skill'. According to Braverman (1976), skill is a multidimensional concept which underlies three main components: technical competence, scarcity and status honour.

Skill covers the worker's ability to imagine how things would appear in final form if such tools and materials were used... He can estimate accurately both aesthetic appeal and functional utility, organise his tools, his power and his materials in a way which accomplishes his task and gains him livelihood and recognition. (Braverman, 1976)

Technical Competence

Technical competence is the ability to do all the tasks required for a

particular project, with a minimum of waste. The importance of technical competence increases as the potential loss from errors increases. An important part of technical competence is flexibility, the ability to handle a variety of similar problems. Utility men on an assembly line are considered more skilled than regular line workers because they are able to do a variety of jobs on the line (Walker, 1992). Flexibility is more valuable as the variability of the inputs and/or the outputs increases.

Another important component of technical competence is conception: the ability to plan a project from beginning to end and to understand the relationships among all the tasks. While conception and execution can be theoretically separated, this assumes that workers are either oblivious to their work, or too ignorant to understand their work. Taylor (1967) claims that the science behind even the simplest jobs is beyond the worker best suited for such jobs. He assumed that a man strong enough for physical labour is too ignorant to understand the scientific principles behind such labour. However, researchers (Kusterer, 1978; Burawoy, 1979; Juravich, 1985) have found that workers have adequate knowledge about at least the empirical principles (if not the scientific principles) behind their work, often more so than management. Therefore, it seems more reasonable to assume that if the workers can do the numerous tasks involved in a project, they can eventually understand the relationship among them.

Scarcity

Scarcity is the ability to do some needed tasks which only a limited number of people can do, often as a result of monopoly closure (More, 1980; Penn, 1982). For example, professional athletes are considered skilled in part because their competence is so rare. They are naturally

scarce. On the other hand, many craft occupations, building trades for example, are scarce because of limits put on who may learn the competence, or who may be certified as having the competence. These competences are scarce because of monopoly closure by the occupation. The ability of an occupation to enclose a set of tasks and to appropriate access to the necessary tools and knowledge depends on its ability to organise, the strength of those it is organising against, both management and other workers, and the timing of its organising efforts (Penn, 1982). Scarcity often allows the workers to include 'unskilled' work in their bundle of tasks, because of the need for their skill at certain times. Repair men and utility men in the auto industry are an example of this kind of work. If the workers can successfully enclose the occupation, management will attempt to organise the workplace to take full advantage of the technical competence of these workers, to make up for their higher cost (Sabel, 1984).

High Status

Occupations that are technically demanding and scarce can often command high status. This status takes the form of unequal rewards of some sort (e.g., higher prestige, income, autonomy) (Freidson, 1970; Penn, 1982). High status honour represents the social recognition of the value of the first two components. It depends not only on the characteristics of the occupation (its scarcity and competence), but also on the culture in which it is located. The occupation must enclose a valued activity. The most successful occupations are the professions, which have completely enclosed a highly valued set of activities, with the state enforcing their monopoly (Freidson, 1970).

Deskilling occurs when a formerly skilled occupation can no longer maintain its high status, either because the technical competence or

scarcity has been removed, or because the tasks are no longer valued. This study seeks to ascertain whether this applies in the case of desktop computer prepress in Kuwait .

While the above typology could be used as an index for measuring the skills of any given occupation, this chapter is concerned with the process of change in skills in prepress production. The researcher's goal here is to show how changes in the technology of the workplace affect specific tasks in the subject, and how the loss or addition of particular tasks affects different components of skill.

Typesetting is an example of a skilled occupation made obsolete by the introduction of a new technology, computerised typesetting. In 1975, the typesetters' union in Chicago used its monopoly power to maintain its members' status, in the form of big wages and favourable work rules (a lifetime job guarantee) in exchange for allowing the introduction of the new technology at the Tribune newspaper. However, when the company asked for concessions in 1983, the union tried to fight on the basis of its organisations' power. It went on strike. The union had been on strike for five years and showed no signs of winning, primarily because the basis for the members' power, their scarcity, has been eroded (Cockburn, 1993). A similar situation occurred in the British printing industry.

Through the last one hundred years of printing, whenever technology of the industry has changed significantly, there has been an impact on those involved in the process. In the early years of the 19th century, for example, when a new and improved printing press was installed at the London Times, pressmen were locked out because of fears they would riot against the possible loss of their jobs. At the end of the century

when newspapers and magazines began to reproduce photographs in their pages, artists and engravers strenuously objected but to no avail. And in the mid-20th century when photocomposition was introduced in the typesetting process, male union typesetters lost their jobs to lower paid female typists.

There has been a long debate in the literature as to whether technological change leads to a deskilling or a reskilling of the workforce (Spenner, 1983; Form, 1987). There has been a society-wide reduction in the skill of the labour force as a result of technological changes and an increased division of labour. These changes are assumed to lead to a labour force which is no longer technically competent. Thus, the above typology of the components of skill could be used to inform the examination of new methods of producing printed matter which have altered the skill level of prepress and printing production workers.

Skill Reducing Properties of Technological Change

According to Reynolds (1958), production technology is the single most important determinant of occupational skills. In the printing industry, skills are generally divided between the functions of composition, preparation and press. The ability to perform the tasks within each function is the principal requirement for the employment of compositors, preparation and press workers.

The effect upon skill requirements of new production techniques varies enormously between innovations. Case studies have been conducted to determine the effects of new methods and equipment on skill requirements in industries such as oil and gas refining electronic equipment, pulp and paper, packaging and medical services. None of

the results of these case studies showed any indication of a sharp or consistent increase in skill requirement as a consequence of switching to newer technologies.

Prepress and printing may be grouped according to their involvement in one of the four major stages of production. The first stage is composition. Compositor's set and make up type from original manuscript. The second, or preparatory stage, involves the transfers of original textual and illustrative material to the printing medium, i.e., a printing plate, used on press. The pressroom stage involves press operators, press assistants and feeders who mount the image carriers on presses, feed the presses with ink and paper, supervise the quality of the printing, and perform routine maintenance on pressroom machinery. The fourth, or finishing stage involves bookbinders and bindery workers. These workers bind printed pages into books and assemble and otherwise prepare printed material for distribution.

Two general types of technological change directly minimise the production skills required of printing craftsmen. The first type of such change was the introduction of process automatic control. For instance, cathode ray tube (CRT) photocomposition allows the supervision and regulation of hyphenation, justification and page make-up to be easily controlled by computers. These computers manipulate coded text and tabular matter into the form of a composed page. By 1977, there was increasing evidence that automatically controlled devices, particularly those concerned with digital imaging, would soon displace the skills of both the preparation and pressroom worker. In the preparation department, displacement was seen to be due to computer controlled cameras such as the Opti-copy. These devices are able to photograph and properly impose full formes automatically. In the pressroom,

computerised press consoles read errors and automatically correct them. The second type of change in production technology is the mechanisation of hand operations. Camera, platemaking and press hand skills requiring long training periods to develop have been displaced by automated equipment (Carter, 1984).

Typesetting and Photocomposition

A 1992 review by the Printing Industries of America (PIA) outlined the influence of digital composition upon the compositor's craft as follows:

The computer, in one of its many roles, has been gradually and painstakingly assuming an increasingly important position as skilled compositor, to which it is rather ideally suited, since this task involves an enormous repetition of well-defined decision processes. The computer has already demonstrated its ability to eliminate the need for the complex compositor skills from the keyboard operator, to provide an enormous increase in the speed of the compositor functions, and to keep pace with developments in electronic photocomposers which promise typesetting of graphic arts quality at speed of thousands of characters per second, intermixed with electronically photocomposed line art, screened halftones, and continuous tone illustrations.

Many techniques and configurations of mechanical, optical and electronic equipment were used in photocomposition. Cathode Ray Tube (CRT) operators were the major photocomposition innovation because they have displaced the skilled compositors who previously performed make-up and setting functions. Expert opinion and trade literature suggested that photocomposition significantly reduced the amount of typesetting craft production skills.

Preparation

In conventional photolitho as practiced heretofore the processes required the three highly skilled functions of photography, stripping

and platemaking. An apprentice in the preparation department was trained in all three skilled functions before specialising.

Photography's objective was the conversion of original images into transparent intermediaries for platemaking. Offset lithography required that original positive copy was converted into a negative image so that, in the process of transfer from cylinder to printed image, the copy was converted back into its original positive, readable form. The cameraman determined the appropriate exposure, film, screen value, and development of the transparent intermediary for each piece of customer copy. Line and halftone photography recorded original images in a manner making it possible to convert them into page carriers for printing. Photographs required an intermediate screen which converted continuous tone images into a pattern of exceedingly small and clearly defined dots of controlled size. Once exposed, the film was developed and stabilised by the cameraman (Strauss, 1967).

The purpose of the stripping function was to convert the original photographed text and art into image carriers for offset lithography. If the finished page was to include a picture and text, the transparent negative of each image must be precisely positioned prior to making the plate. Printing in more than one colour adds considerable complexity to the stripping operation. When printing one colour, units of copy must be assembled for exposure on a single plate. Multi-colour printing requires different plates for each colour. These are registered in such a way as to overprint each other precisely (Strauss, 1967).

Platemaking was the final phase of the conversion of original images into offset printing image carriers. The product of lithographic platemaking was a single unit image carrier. All images on the carrier

were completely assembled as they would appear on the printed sheet (Munson, 1968). Platemaking involved three steps: preparing the plate to receive the image, placing the image on the plate, and developing the exposed image.

Technology's Impact Upon Printing Organisations

The impact of computer technology on the graphic arts industry also affects unions, companies and employees. The steady decline of industrial profit margins after World War II has led many large printing establishments to introduce more sophisticated printing technologies, particularly computerised typesetting processes which have routinised work tasks and led to a decline of skill among printing craftsmen (Wallace & Kalleberg, 1982).

The rapid advances of computer technology made in the graphic arts industry has also had a dramatic impact on printing organisations. These influences are well documented by such researchers as Carter (1984) and Ezell (1987). Carter (1984) studied computerisation as a dominant technology, focusing on the aspects of decision-making and division of labour. With its knowledge of the reliability of computers, upper management now is more confident about decentralising decision making. However, Carter found that labour still had questions about computerisation. She showed that the use of computers in production had the greatest influence on job satisfaction of new copy editors; use of computers in circulation and newsroom tasks affecting new workers' decisions about copy editing.

Ezell (1987) analysed the effects of firm size, concentration, profits, product consumption, unionisation, and strikes resulting from the adoption of computer technology, using the newspaper industry as a

case study. He found that greater managerial control over the production process tends to lead to greater efficiency in the printing business. Thus, the traditionally high degree of a printer's job control has declined as automated computerised typesetting technology has been adopted. He also reported that smaller firms often implement new technology as rapidly as their larger, more concentrated counterparts. The findings of his investigation of the effects of technological changes on workers and their reactions to the rate of change supported the concept that printers had been less resistant to changes in technology when job security and wage levels were maintained.

Carter (1984) investigated the role of management in technological change and organisational decision-making, focusing on technology decisions. Managers have worked in the business and financial communities establishing contacts and securing resources. They have developed product markets and ensured that production proceeds smoothly. All this has made technological adoptions possible.

Role of Computer Utilisation in Art and Design

The utilisation of computer technology in art and design has advanced at a very rapid rate, and is used by increasing numbers of graphic artists and designers on a daily basis. This approach to art is exercised by means of the creative process of constructing visual images, wherein artists use computers to develop and expand their creative ideas and their growth potentials. The computer has thus been used since early 1964 as a medium for the creation of aesthetic imagery (Davis, 1973; Peterson, 1984).

This transition did not occur overnight and, among higher educational institutions, there has been some resistance to the implementation of the

concept of the computer as a medium for creative art. Many authorities in the field feel that the computer is merely a scientific instrument and cannot be used as an artistic tool. These attitudes assured that artists and designers did not initially have access to appropriate hardware or software for the development and design of products for aesthetic purposes. As observed in the 1989 *Computer Graphics Career Handbook*:

To make early computer graphics system work, people needed to learn computer languages, operating systems, hardware and communications as well as computer graphics. Since there were often no resources to support the highly specialized needs of computer graphics, computer graphics experimenters had to do the work themselves.

At present, computers are utilised by a substantial number of artists and designers. Garnett (1994) has stated that the artist and designer of the future will increasingly use computers as a design tool since they enhance creativity and the ability to explore new areas. Thus, some artists and designers use computers to create two-dimensional images and animation, while others are exploring the use of computers in such areas as weaving, sculpture, and the performance arts. Hiesinger (1983) stated that the use of computer devices will allow artists and designers to achieve extremely difficult or impossible tasks. Certainly, the computer can be used to increase design speed and to expand the range of the designer's work. As a visual arts medium, computers can be used in a variety of ways to simulate activities and arts management activities currently produced in studios. It has been only recently that artists have begun to explore the potential of computers as an art medium, using computer software to process compositional problems or to program the computer to produce visual solutions. Computer graphics provide a significant potential for design progress insofar as

the processors enable artists to generate large numbers of different solutions to given visual problems in short periods of time.

Impact on the Creative Process of Design

The use of a computer to create or enhance an image began over twenty-five years ago. In this relatively short period of time, no other medium has had such an extraordinary effect on all the visual arts (Negroponte, 1995). The computer image is created through the use of a computer, but how the computer is used differs widely. The image may be created through mathematical formulas, drafting or design object-oriented programs, or it might be created using a paint program and an electronic stylus and digitising tablet.

Many designers willingly accept the computerisation of design production but balk at high-tech interface with the creative, conceptual phases of the design process. However, the development of computer technology, both hardware and software, as well as the expansion of the creative values and standards have led to the development and consolidation of a visual language unique to computer generated images. The microcomputer has become an ideal tool for accessing, organising, manipulating, visualising, and evaluating information relative to a design problem. This process, of logically exploring a problem by playfully coaxing the user into manipulating information in ways that new combinations and fresh ideas surface, is known as creative problem solving (Basadur & Graen, 1990).

The computer configured as an artist's workstation is a powerful tool, and catalyst for visual thinking. Although it is viewed as a tool, it can significantly influence the conceptual creative process (Vince, 1992). What used to be solid and permanent artwork is now reduced to a

flickering collection of dots on a screen. To the computer artwork is not a physical object but an abstract series of signals which opens limitless possibilities for creative interaction. Problem solving is altered because visual material is not fixed, but exists as changeable numeric data. This data can be acted upon by both the hardware and the software and until a piece is fixed on paper or film, it is subject to change, yielding a flexibility that is unparalleled in any other medium. This phenomenon offers the artist an opportunity to examine the creative act as a multidimensional process, in which decisions can be interrelated in such a way that far more fascinating possibilities and solutions begin to emerge.

Just as the computer has taken over some perfunctory duties in writing, the image-generating station can take over calculations for the designers and artist. The storage capacity of the machine allows an artist to make many changes in a work, saving each change separately, thereby offering a more relaxed approach to decision making. The artist can save many variations on any theme, be they colour, scale, or texture. This flexibility will have a far greater impact on the artist than the word processor has had on the writer. Researchers expect that this will significantly alter the design process (Alvey, Wilcox, Morrison, 1990). With increased flexibility in the end stages of production, the artist might well delay or lengthen the final decision making processes that generally occur earlier in the creative stages. Thus, the creative processes may experience shifts in working energy expended, experimentation, and even creative play.

As the result of an ongoing technological revolution, the computer is now one of the major devices used in conceptualising, developing, and producing materials for both print and electronic graphic

communications. Computerised design is one of the most developing fields in visual communications. The computer is swiftly becoming the tool of choice for an entire generation of new designers, and to an extent, artists. And those in the industry are making the change to the new technology. More than a tool in the realm of fine arts, a typesetter in the printing industry, or a special effects generator in television arts, the computer has become a communication tool which rivals the camera in its pervasiveness and utility.

Graphic Artists in Transition: The Blurring of Roles

The graphic design profession is a primary contributor to modern visual culture. Designers are translators, interpreting written and verbal information into visual imagery. Graphic communication techniques are used for persuasive, informative, and educational purposes. The sensitive use of text, images, colour, and paper can communicate subconscious messages that written text alone could never convey. The increased need for design and the complexity of new modes of communication demand new roles of designers requiring multidisciplinary professional skills beyond the scope of artistic talent.

Computer technology is playing an important role in defining the scope of today's designer and microcomputers are addressing the needs of both the creative and practical tasks of designers. A decade ago graphic designers had little exposure to computer graphics as early systems were far from user-friendly. But during the intervening years, the tidal wave of this technology washed over the graphic arts industries, as powerful computer tools enable designers to gain control over production. Design, typesetting, and page layout can all be created in the same place by one person or group. The advantages of computers are a quicker turnover, less chance for errors, cost reduction, and a more

personalised involvement with the actual product.

The design industry is currently undergoing the same kind of technological revolution that publishing houses experienced in the 1960s and 1970s. Desktop design, photograph manipulation, graphics and high-end prepress software have replaced many of the tools and drawing tables in studios (Vince, 1992). Design houses worldwide are scrambling to stay abreast of the flood of hardware and software innovations. Packaging design firms are using 3-D programs for design and presentation work, enabling both client and designer to explore many possibilities. The drafting table has been replaced with a hard disk full of typesetting, design, multimedia, and illustration applications. The designer is becoming a broad-based multimedia resource and is shifting to a different level of communication with clients. Iagemaking disciplines are enjoying an evolution of epic proportions.

Emerging technologies have had a significant effect on the processes, methods, and materials of the graphic designer. The design educator, practitioner, and the industry, have been faced with the necessity either to adopt new tools, or to exist in a less productive, less competitive academic environment or practice. These transitions to improved technologies were occurring simultaneously, though at different levels. The computer inevitably took its current and ever-emerging place as the ultimate design tool. However, this transition from time honoured tools (T-squares, templates, technical drawing pens, etc.) to computer-based media is still an issue in design programs and in the designer's workplace.

Along with an array of new technological developments, the following

changes have occurred: revised job descriptions for graphic designers, a new breed of entry-level designers with advanced computer skills, and new applications for the technology. The January/February 1993 issue of *Communication Arts* magazine's 'Technology' column contained a panel discussion with five well-known graphic designers who participated in an exchange on the role of computers in design. It was organised by *Seybold Seminars* and held at its 1992 Seybold San Francisco meeting. This panel discussion was entitled 'Design in Transition: The impact of Technology'. These designers had all started with a traditional education including its tools, projects, and processes, but had transformed their knowledge and skills by adding emerging technologies, including the incorporation of interactive media into their repertoire of design services. The panelists included Lance Hidy, type and poster designer; Clement Mok, Creative Director at Apple Computer; Wendy Richmond 'Design Technology' columnist for *Communication Arts* magazine; Greg Samata, a partner in Samata Associates; and Leslie Smolan, a principal and partner in New York-based Carbone Smolan Associates.

The insights of these five panelists are important because they briefly discuss some of the issues addressed in this chapter. They spoke historically about what once were the standard tools and practices of graphic design. They also mention technology's impact on the role of the designer. The panelists even offer a few projections for the future with respect to graphic designers.

Once traditionally vended out to specialised firms, services such as typesetting and colour separations can now be done internally by the designer or by someone on staff. One of the panelists, Lance Hidy and his firm have brought typesetting, prepress, and other computer tasks

in-house. These additions have eliminated about four or five different vendors, and reduced the duties of tracking schedules, observing deadlines, and general orchestration of the project. According to panelist Lance Hidy, clients are spared both the 'overhead and hassle'. Through the implementation of computer-based media, some services which were once vended out are performed in-house. Panelists like Hidy and Mok are now able to pass some savings on to the client.

On the other hand, panelist Greg Samata vows never to do colour separations in his office, because he feels an engraver or a vendor with more advanced equipment, craftsmen, and technology can better perform tasks such as these. Likewise, panelist Leslie Smolan feels that typesetting and separations are jobs best left to the specialists who have traditionally performed them. She explains, "I already know how to delegate those perfectly". Although design firms and departments have gained as a result of technology, Smolan indicates that much of the design firm's 'bread and butter work', such as the application of identity systems, has been lost or is now performed internally by the client. However, Smolan insists that the client historically, currently, and in the future, will be "buying our creativity and our thinking" (Seybold San Francisco Seminar, 1992).

The panelists also discuss the transition's impact on students. The effect of computers is reflected in the knowledge and skill level of recent graduates of today's design education system. When trying to fill a design position within her firm, Smolan sought to hire someone with traditional drawing skills, but was told that "anyone who graduated after a certain year cannot draw anymore, because they went right to the computer". She described this comment as "a horrible thought".

Similarly, when Samata needed two new production people for entry-level positions at his firm, he had in mind persons who would be talented, and creative, in addition to possessing computer skills. He hired two people who fit this description. All of the pieces in their portfolios were very high resolution Iris printouts. Samata notes that although they had 'beautiful portfolios', he later discovered that they had no hand skills. Because graphic design is a concept-focused field, the ability to do preliminary drawings is still an essential skill. Samata feels much vital time can be wasted "looking for the answer in a machine".

On the topic of the future role of the designer, the panelists note that technology is redefining the field of graphic design, particularly with respect to interactive multimedia. Mok (panelist) has managed a career which spans a broad range of media including print, video, computer-based multimedia, event marketing and environmental design. He foresees shifting the position of his studio to focus on executive producers, and assembling teams for interactive digital demos, titles, book covers, etc. Mok envisions and describes his firm as a "system integrator for design". Richmond (panelist) offers future applications and she forecasts more of the 'multi-versioning' process which she is now involved in at her studio. This process involves taking one idea and producing from it several different products in assorted media (i.e., CD ROM titles, videos, interactive books, audio cassettes, etc.).

Because of transitions such as these, Hidy credits computer technology for allowing designers to position themselves for a variety of career paths in education and in practice. He says, "one of the good things about the computer is that it allows you to customise your own job descriptions".

Computer Literacy in Art Education

In the early 1970s, concepts of computer literacy were based upon understanding of computers and computer technology sufficient to enable the conduct of intelligent conversations. However, since the role of computers has become increasingly important to our everyday lives, the meaning of computer literacy has changed. D'Souza (1985) distinguished three levels of computer understanding: awareness, literacy, and fluency. He has synthesised these levels as follows:

Computer awareness is the lowest level of understanding, implying reasonable comprehension about what a computer is, and what it can or cannot do. Computer literacy implies a reasonable comprehension level about computers and how to use them. It includes a working vocabulary about computers and information system processing, and a perspective for how non-technical people can manage in the world of technology. Computer fluency, the highest level of computer understanding, describes a person with the ability to write and analyze computer programs, with an understanding of system programs, system analysis and design, and knowledge of data management systems.

However, in the art and design fields, computer literacy and the skills necessary for the effective use of computer technologies have not been clearly identified. Therefore, artists, designers, and art educators have different views of computer literacy. A number of art educators have encouraged the use of computers in art curricula. Swann (1997) has suggested that the computer be used for classroom management and for tutoring purposes in art history and aesthetic instruction.

Holtzschue (1997) envisioned the role of the computer as an instructional aid, a management tool, and as an instrument for the creation of art, and it has been in the latter area that many art educators have lent their support. However, both the diversity and importance of

these views may have been over-rated. According to Hickman (1990), if the observer adopts the perspective that computer literacy is a matter of functioning effectively within a given role, then it becomes more obvious why some people can exist at lower levels of understanding while others require more sophisticated understanding. The perspective of computer literacy provided by Hickman (1990) offers a utilitarian point of view. Computer literacy is best defined as whatever computer knowledge and skills one needs to function effectively in a given role. This includes the ability to evaluate appropriate use of computers, to plan and execute various applications of computers, and most importantly, the ability to understand how computers are impacting us socially, psychologically, culturally and ethically.

Impact of Computers in Art and Design Education

The word 'design', according to the Webster's New World Dictionary of Computer Terms (1992), means to plan or contrive. However, design has been attributed a far wider frame of reference in the present information-based, high-technology society, representing different things to different people. Koberg and Bagnal (1991) indicated that design was the process of creative problem solving in human behaviour. It is the organisation of parts into a coherent whole, or the exercise of a series of decisions, formulated to arrive at the one best solution. In practical terms, design is the effort to plan a meaningful order.

Design is the product of creative problem solving activities that individuals or groups, including architects, engineers, craftsmen, artists, and entrepreneurs, direct toward the best problem solutions within given guidelines or limitations. 'To design' can imply a wide range of activities, from the simple to the complex and sophisticated. Koberg and Bagnal (1991) stated that everyone is a designer, thus design is

considered to be a basic aspect of human life and activities. However, although everything fabricated by humans is designed, not everything can be considered to be well-designed. Good design is evident when the final product is functional while providing aesthetic qualities. No effort has been made to the development of a theory of Arabic design. However, modern design theory, just as design in universal practice, no longer involves only an aesthetic process, but is moving toward an understanding of human social contexts as well.

A review of the literature concerned with the use and impact of computers in art and design provides evidence of a diversity of viewpoints. Each designer possesses some form of visual problem solving skills, and it is difficult to deny that some individuals accomplish this better than others. The more the designer understands the process of creative problem solving, the more interesting and meaningful the results will be. Computer technologies have come to play an increasingly important role in the design process, to the point of influencing how the designer thinks (Lawson, 1990). However, according to Swann (1997), computer technology cannot replace creative human thinking skills since the machine cannot think or differentiate between routine and creative approaches. Thus, the computer can only be used as a tool for the solution of creative problems within the design process. From the creative aspect, the design process has not changed from what it was in the past; the creative problem solving process remains the basic component, regardless of the nature of the materials and technologies used by the designer.

Current evidence indicates that designers will become increasingly involved with the computer technologies. Swann (1997) notes that

computers basically help designers by providing the support and organisational capacity that allows a designer to fit together elements of the design process. He identifies three impacts that computers have upon art and design education: 1) as media used within the art studio environment; 2) as research and instructional tools for teaching art history and art appreciation; and 3) as tools for classroom management, including the maintenance of student records and supply inventories. Modern computers can also be used as vehicles for the solution of visual problems, allowing artists and designers to experiment with ideas placed before them on a computer monitor.

Hiesinger and Marcus (1995) indicate that design education should encourage the use and development of new visual languages created by electronic and computer technology. However, Lawson (1998) cautions that the successful designer must have not only a sound knowledge of the technologies relevant to the field, but also artistic awareness of design elements and principles. The creation of a design is the single most important element in the visual arts and is centered upon the individual designer's creative and visual problem solving processes. Thus, it is not sufficient to be technically competent in the absence of developed aesthetic capabilities. He cautions that design could only be taught by moving to the heart of a specific problem to be solved; thus design education must remain practical since the analysis of realistic problems is the only way to find useful solutions.

Future of Computer Technology in Art and Design

In western societies at present, computer-aided design is no longer simply a concept, and many designers have accepted computers as tools, replacing hand labour in the repetitive aspects of the design process. Lawson (1998) indicates that the main focus of computers in art

and design would be more than just the utilisation of computers as art and design tools. To fit into the context of the information environment, artists and designers must use computer technology intelligently with clear understanding of the tasks for which it can be used. Thus, computers can be used as tools to help artist and designers analyse, organise, and evaluate information, serving as key instruments in the thinking process. The result will be a rapid production speed increase, as well as a craft in which art work can be erased, restored, analysed, and modified with great depth and precision. It is incumbent upon artists and designers to adapt this computer technology to the end of expressing and creating new art forms and ideas. The need for clear and imaginative visual communications to relate people to their cultural, economic, and social lives has never been greater.

Lawson (1998) states that computer technology would have a great impact on the future of life in the West. Artists and designers would use the computer as a design tool since it would allow them to explore their own imaginations and create new designs far beyond the capabilities of traditional tools. Difficult tasks that could not in the past be challenged, would be undertaken as both the speed and range of the designers' work passed beyond traditional barriers. The computer is here to stay because it has made it possible for artists and designers to create images that once could be found only in their dreams, a sentiment to which the above cited researchers have indicated agreement. Therefore, numerous artists and designers have indicated their readiness to accept computers not just as tools, but even as replacements for traditional tools. This search for new forms, materials, and tools has led artists and designers to explore many branches of technology with interesting results.

The development of computer graphics as two- and three-dimensional tools and for manipulation of images during production stages of

commercials and printed matter will continue. Computer graphics become deeply established in processes where they save time in extremely deadline-department business, such as magazine production, where last minute changes are the rule. The pressure to produce mechanicals on a tight deadline for client approval and then for printing is matched by the pressure for quality. The quality norms in these fields are very high, specially, the sharpness and selection of type, the matching, richness and variety of colour, and simply stated, the accuracy of getting what the designers intends out of the computer system.

Presently, artists and designers are faced with the development and implementation of computer technology as well as the integration of new materials into their work. The computer can function for artists and designers at many different levels. Artists have only to choose what role they wish the computer to play, and have indicated that they will allow the computer to function as an idea machine. Hiesinger and Marcus (1995) predict that more artists and designers would head toward the large-scale utilisation of machines for the creation of art, but that computer art must be differentiated from the many artistic styles and fashions of the past. He indicates that the entry of the computer into art was a technical process equally as irreversible as the introduction of the machine into the manufacturing production process. The computer will help artists and designers develop new art and new perceptions in a realm of nearly unlimited possibilities. Each new program functions virtually as a new set of tools and the type and quality of work produced will be dependent both on the artist who uses the machine and program capabilities.

For many the computer seems not only to limit the artist's intuitive

response to his/her own unfolding creation, but also prevents him/her from leaving any personal trace in the execution of the work. Granted he/she can devise a program uniquely suited to a particular artistic conception, and can accept, reject, or modify the image as it emerges on the screen. The artist can even vary the quality of line and introduce a variety of colouristic effects. Yet somehow all this seems limited when measured against an 'oldmaster' drawing, in which every line and every nuance directly reflects its creator's individual response to the medium. However, to consider computer-generated graphics in this light is to remove them from their proper artistic context. Like so many 'conceptual' works of the past several years, the creative process is centered not in the execution of the work, but in the artist's mind as he conceives the idea for a piece.

More recently, Lawson (1998) indicates that artists and designers who know how to use computers will have a different set of skills from those who have only computer skills or design skills. He encourages the concept of artists who use computer programming as a tool to help with the creation of images. However, artists must communicate and define their ideas in sufficient detail to enable understanding of their artistic requirements by computer programmers. If this is not the case, then the end result may not even resemble what the artist had sought to achieve. The computer itself would be unable to create art or designs without human creative input. However, the computer would allow artists and designers to achieve greater creative thought without losing the sense of their work.

Though the gap between the fine arts and computer technology has been considerably narrowed in recent years, the benefits of computer art and design are often counterbalanced by an equally important set of

disadvantages as in the case of most technological developments. There is also strong agreement on certain non-technical artistic skills that are not necessarily related to computing. As well as skills in the arts and graphics, design professionals must reflect certain skills in personal communication, management, writing, presentations, and financial management, to which now must be added the development of the knowledge of computer operating systems and, in some cases, programming languages. It is inevitable that these shifts in attitudes will be followed by a corresponding change in the professional image of the artist. At the very least, designers and educators may in the future be required to do some degree of programming. The disappearance of the distinction between the producers of fine and applied arts appears to be of far greater impact. However, it would seem likely that we are witnessing the emergence of a new and exceptionally important area of activity centering upon the visualisation of information.

Computers are no doubt changing forever the working environment of the graphic arts industry. Whether or not changing the Arabic designer's profile to the creative problem-solving process, and whether or not changing the visual appearance of Arabic publications cannot absolutely be determined. This study will investigate the impact of the new technology on the design of Arabic publications and the people involved in the process. In order to better understand the relationship between computer technology and Arabic design and designers, the next chapter overviews the development and computerisation of the Arabic script.

Chapter 4

THE DEVELOPMENT OF THE ARABIC SCRIPT AND ITS ADAPTATION TO PRINTING TECHNOLOGY

A major part of this study is to determine whether or not there is a detectable change in the design of Arabic publication as a result of using the computer, and whether the Western rules and conventions governing typographic functions can be utilised to serve Arabic design. In order to achieve this objective, a background of the typographic evolution of the Arabic script and its composition is provided in this chapter. Because of the dependence of Arabic typography on traditional calligraphy, the chapter is divided into these interrelated parts. First, this chapter traces the development of the Arabic script and discusses the connotative and affective values associated with Arabic calligraphy and type styles. Second, it focuses on the Arabic orthography in relation to the Latin alphabet and in particular to the characteristics of its letters. Third, it discusses the adaptation of the Arabic script to digital typesetting and printing technologies.

The Arabic Language

Arabic is one of the world's major languages. It is widely spoken on two continents, across the entire breadth of North Africa to the Arabian peninsula and the entire Middle East. It is the official language of eighteen countries with a total population of about 200 million, placing it among the top ten tongues of the world in number of speakers.

Its literary tradition goes back about thirteen centuries, it is the language of one of the world's major religions — Islam — and it is the written and spoken means of communication in a region of steadily

rising importance in international affairs: the Middle East. The numerical, geographical, political, and cultural status of the language was formally recognised by the United Nations in 1973, when Arabic was made the sixth official language of that body (the others are English, French, Spanish, Russian, and Chinese).

Arabic is considered a difficult language to learn. One of the problems is that the term 'Arabic' is used to describe three different forms of the same language: classical Arabic, modern standard, and colloquial. Classical Arabic is the language of poetry and literature, and of liturgical and historical treaties. For example, the Qur'an (the holy book of Islam) is written in classical Arabic. Colloquial, or spoken, Arabic, is used in the daily lives of the people of the Arab countries. In general, native speakers do not consider colloquial printed Arabic as correct because it is inconsistent with the grammatical and lexical code set out for classical Arabic and the modern standard Arabic which followed. Colloquial Arabic shows great diversity from region to region and among different layers of the population. Moreover, the various dialects differ quite considerably from the written language in vocabulary and grammar, as well as in syntax. The modern standard Arabic, sometimes also called modern literary Arabic, has evolved very gradually from the codified version of the language, although it varies somewhat in idiom and vocabulary. Although modern Arabic has added vocabulary and idiom to the ancient foundation, much has been lost in terms of linguistic richness. Today, modern standard Arabic is the vehicle for printed communications throughout the modern Arabic-speaking world, and there is much debate on the subject of language rejuvenation (Brunner, 1990).

There is a direct link between classical Arabic and modern standard

Arabic, which is the written language of the entire Arab world today. Any newspaper published anywhere in the Arab world, for instance, can be read without the slightest problem anywhere else in the Arab world. Newspapers, magazines, official documents, poetry, all works of non-fiction, and the vast majority of prose literature are all written in modern standard Arabic, which shows virtually no regional variation. Most radio and television broadcasts (especially news programmes and political speeches) are given in a spoken version of the written language. In other words, every Arab who is literate reads modern standard Arabic (the colloquial languages are not written, except occasionally as dialogue in plays and novels), and because of the widening influence of radio and television throughout the Arab world, nearly every Arab, even if illiterate, will understand the spoken version of modern standard Arabic to some extent.

In many ways, modern standard Arabic is quite close to classical Arabic. The Qur'an, which was first written down about twelve centuries ago, has always been a major grammatical and linguistic authority. The existence of a commonly accepted literary standard has been a powerful unifying force in the written language.

Origins of the Arabic Script

Arabic belongs to the group of Semitic alphabetical scripts in which mainly the consonants are represented. Its alphabet, with the occasional modification, is used to write other, non-Semitic languages as well, such as Persian, Urdu, and Kurdish. Until about sixty years ago, Turkish was also written with a modified Arabic alphabet, as were several leading African languages, notably Hausa and Swahili.

In contrast to other nations such as the ancient Egyptians, the

Babylonians and the Chinese, whose complex writing systems date back thousands of years, the Arabs were comparative late comers. Although Arabic is only second to the Roman alphabet in terms of widespread use even today, the Arabic script was developed at a much later date which goes back to the fourth century. The reason for this late development was that the Arabs were mainly a nomadic people and mistrustful of the written word. They relied to a very great extent on oral tradition for the retention of information and for communication. In pre-Islamic times, and especially in the sixth century, which was the heroic age of literature for the Arabs, poetry was perhaps the thing dearest to their hearts and the only means of literary expression, yet they relied almost exclusively on oral tradition for the perpetuation of their poems (Safadi, 1992).

Although in the past there have been many contentious views about the origins of the Arabic script and its relation to those in the Semitic group, all serious scholars agree today that the North Arabic script, which eventually prevailed and became the Arabic of the Qur'an, relates most substantially and directly to the Nabataean script, which was itself derived from the Aramaic script (Figure 4.1).

The Nabataeans, who were semi-nomadic Arabs, inhabited an area extending from Sinai and northern Arabia to southern Syria and had a close relationship with all neighbouring tribes. The first movement toward establishing a formal Arabic script was born in northeastern Arabia in the fifth century among Arabic tribes who inhabited the regions of Hiran and Anbar. From there its use spread, in the early sixth century, to Hijaz in western Arabia. This writing system was accepted by some individuals amongst the people of Hijaz.

Bishr ibn Abd al-Malik is reputed to have introduced it into Makka with the aid of his friend and father in law Harb Ibn Umayyah. It is Harb, however, who is credited with having popularised its use among the aristocracy of Quraysh, the tribe of the prophet Muhammad (Safadi, 1992).

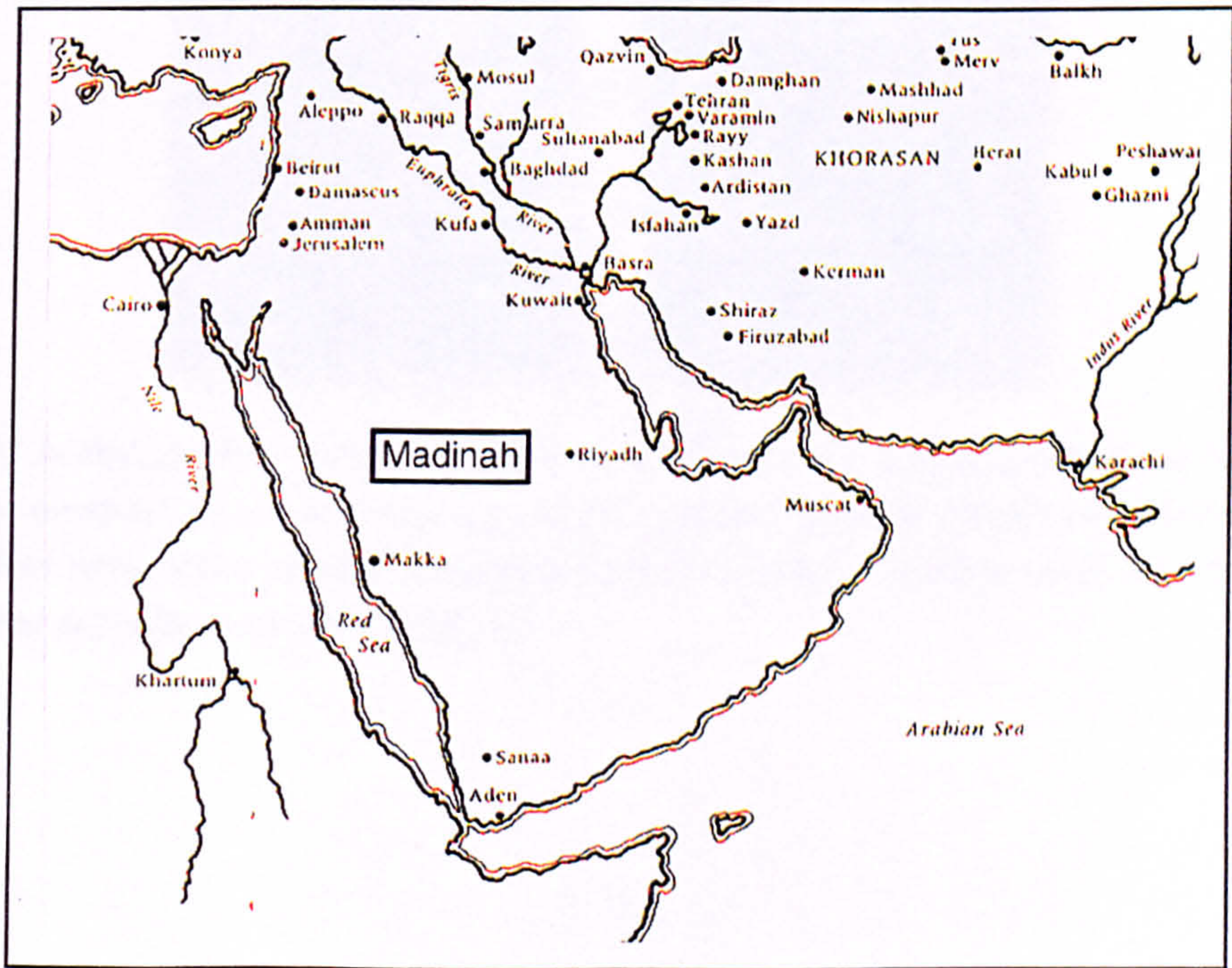
Within a short period of time the writing system spread to the nearby town of Madinah and was adapted by the tribes of Aws, Khazraj and Thagif (Figure 4.2). The script, at the early stage, was somewhat difficult to use for communication due to the need of developing an orthological construction system. By the end of the sixth century, Abul-Aswad al-Duali was credited as the legendary founder of Arabic grammar. Clear understanding of the pronunciation of the Arabic alphabet was achieved when Al-Hajjaj Ibn Usuf al-Thagafi encouraged others to derive a writing system similar to the 'al-Duali'. His major concern was to differentiate between the different consonants which had, up to this time, identical letter outlines. A system of dots was the result in which similar alphabet outlines could be varied by placing one or more dots above, below, or within a specific letter (Figure 4.3). Consequently, the Arabic writing system and its rules of grammatical construction were achieved by the seventh century (Safadi, 1992).

According to Arab literary traditions, only the seven odes called 'al-Mu'allaqat', which were considered absolute masterpieces, were committed to writing and especially honoured by being inscribed in golden letters and hung on the walls of the Ka'bah at Mecca. Even after the advent of Islam in the early seventh century, the Qur'an was at first mainly transmitted among the Muslims, not through the written word but by oral tradition.

Figure 4.1
Nabataean Inscriptions Providing Proof of the Origins of Arabic Script

Source: Al Baba, K. (1988). *The Spirit of Arabic Calligraphy*. Lebanon: Lebanon Printing & Publishing.

Figure 4.2
Map of Arabia



General Characteristics of Arabic Script

Figure 4.3
The Seventeen Distinct Forms of the Arabic Alphabet

a	b
أ	ب ت ث
ك	ج ح خ
ل	د ذ
م	ر ز
ن	س ش
هـ	ص ض
و	ط ظ
ي	ع غ
	ف ق

The Arabic alphabet is derived from only 17 distinct forms, distinguished one from one another by a dot or dots placed above or below the letter. These dots above or below some letters are the identifying elements of different letters which have the same or similar structure (column b).

General Characteristics of Arabic Script

The basic Arabic alphabet consists of a set of 28 letters — or 29 if the ‘lam-alif’ ligature is included, representing mainly the consonants and a few long vowels (Figure 4.4).

Figure 4.4
The Arabic Alphabet and English Transliteration



Source: Awde. N. (1990). *The Arabic Alphabet*. Egypt, Cairo: The American University Press.

As noted earlier, these letters are derived from only 17 distinct forms, distinguished one from one another by a dot or dots placed above or below the letter. The script exhibits a number of unusual and confusing features. It is extended to some 90 elements by additional shapes, marks, and vowels formally recognised in the Arabic morphology. A large number of diacritical signs, which are similar to accent marks of

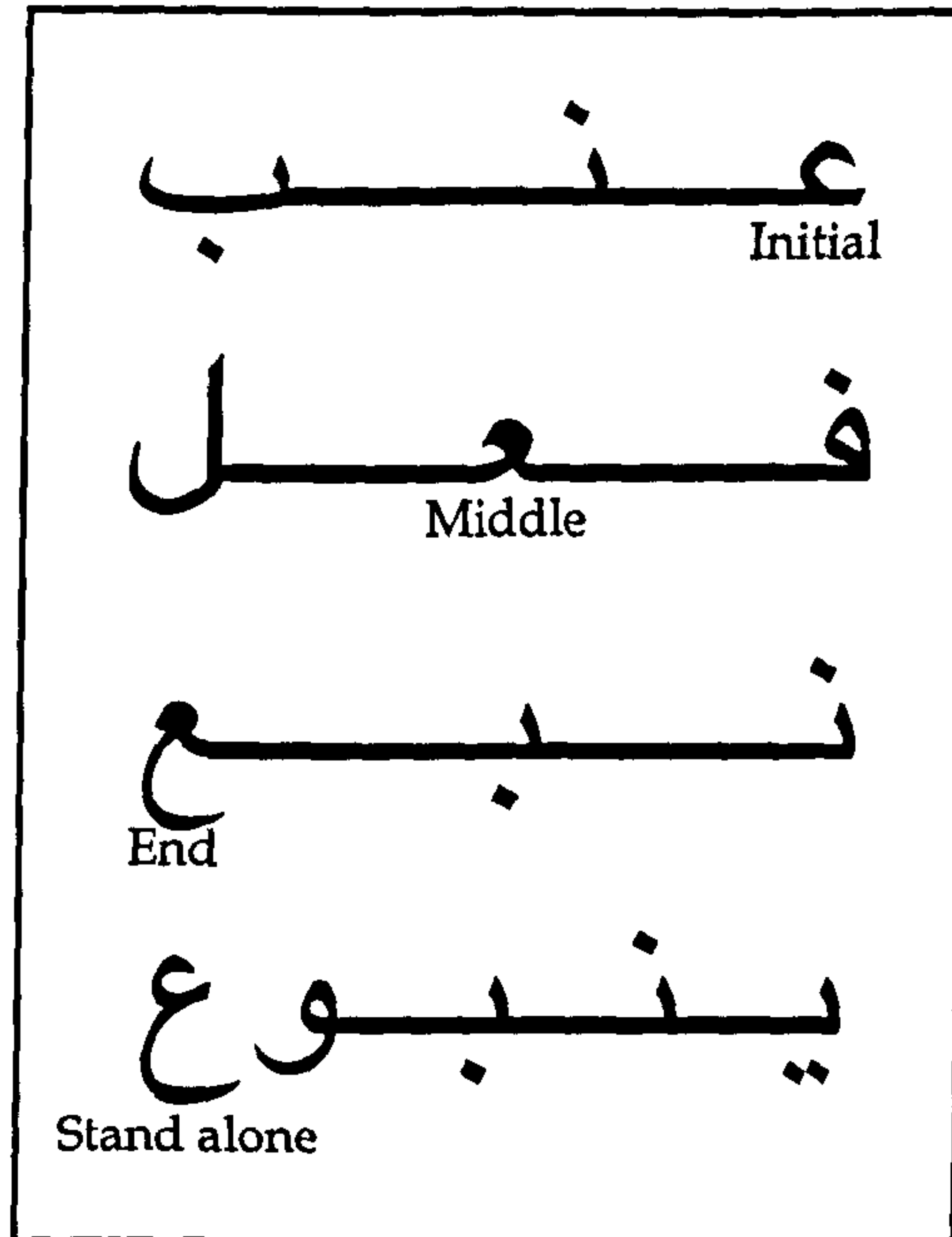
European languages, are used to mark short vowels and emphasise or loosen a letter's sound. These marks can be mixed and written above or below the characters to produce composite phonetic effects (Figure 4.5). Short vowels are indicated by small diagonal strokes above or below letters. Written without dots and diacritical points, Arabic script looks flat and barren. But when the dots and diacritical points are added, the script comes to life. The Arabic script, which evolved in contemplation of the traditions of handwriting, is context sensitive. The shape of most of the characters depends on their position within a word and the characters adjacent to them. Each character may be represented up to four different ways of which only one would be correct in a particular situation (Figure 4.6). Moreover, many of these intermediary forms depend on the adopted calligraphic style. As an extreme case of contextual reshaping, Arabic script allows ligatures between characters. In other words, adjacent letters can be fused to produce new graphical forms. In order to emulate handwriting, approximately 400 ligatures are available, yet only three of them have mandatory usage.

The dots above or below some letters are the identifying elements of different letters which have the same or similar structure. The Arabic script is essentially cursive, the movement of the pen continuing from one letter to the next throughout the word. One of the factors which makes Arabic difficult to learn and difficult to compose is that, as pointed above, the majority of the letter forms have different shapes, depending upon where they appear in the word. That is, a letter in the initial position in a word may have a different form from the same letter in medial or final position, or when it stands alone. Thus, the range of letter shapes and word designs is very large indeed.

Figure 4.5
Diacritical Signs in a Text Block

يقصد "بالنشر الإلكتروني" تجهيز واختزان وتوزيع المعلومات باستخدام الكمبيوتر والاتصالات عن بعد والمنافذ الطرفية. وللتحديد يمكن أن يقتصر على تلك الأنشطة التي تنشر فيها المعلومات بالوسائل الإلكترونية. أما "النشر المكتبي" فيقصد به النشر المطبوع على الورق باستخدام الكمبيوتر الشخصي والصف المتعدد للوثيقة بشكل إخراجي متميز. دخل الكمبيوتر في الستينات لأول مرة لتشغيل وسائل الصف الإلكتروني للكتب في عمليات الطباعة، بعد أن كان مجرد آلة حسابية فقط تستخدمها المؤسسات الكبرى في إجراء الحسابات المعقدة. وفي السبعينات أدى التطور والربط بين الكمبيوتر وتقنيات الاتصالات الأخرى إلى مولد نظم المعلومات المتعددة على الخط المباشر. ومع ظهور الكمبيوتر الشخصي في أواخر السبعينات ظهرت برمجيات لها قدرة محدودة على جمع الحروف اشتغرت بأسر معاجلات الكلمات. وفي الثمانينات تطور الأمر وظهرت برمجيات النشر المكتبي المصممة لاستقبال النص من معالج الكلمات، واستقبال الصور التي قد أدخلت إلى الكمبيوتر بواسطة الماسحات الضوئية ودمج الكلمات مع الصور لتكوين صفحات أنيقة. كذلك يلاحظ بأن تقدم هذه التقنيات وخاصة فيما يتعلق بطاقات الاختزان الكبيرة في مجال الاتصالات وشبكات المعلومات من جهة ثانية، قد أسفر في السنوات الأخيرة عن إمكانية النشر الإلكتروني بالكامل. برز النشر المكتبي في السنوات الأخيرة كواحد من التطبيقات الجديدة وربما الأكثر إثارة للحاسب المصغر وأصبح مصطلح "النشر المكتبي" من أكثر المصطلحات استعمالاً في مجال الطباعة.

Figure 4.6
The Different Shapes of the Arabic Alphabet



A letter in the initial position in a word may have a different form from the same letter in medial or final position, or when it stands alone.

Written from right to left, the Arabic script at its best can be a flowing continuum of ascending verticals, descending curves, and temperate horizontals, achieving a measured balance between static perfection of individual form and paced and rhythmic movement. There is great variability in form: words and letters can be compacted to a dense knot or drawn out to great length; they can be angular or curving; they can be small or large. The range of possibilities is almost infinite, and the scribes of Islam laboured with passion to unfold the promise of the script. Moreover, technical aspects were not separated from aesthetic and even personal criteria. Inscriptions are found incorporated in the decoration of almost every Islamic work, and in that of a large number of objects as well. (Safadi, 1978)

Orientation of the Arabic script is from right to left, but Arabic numerals are written and read from left to right. The Arabic script has no hyphenation or variation in interword space. Text is justified by adding length to the horizontal strokes of certain characters to expand individual words so that the entire line fits the horizontal measure. This process of lengthening is referred to as 'medda' or 'kasheda' insertion and can only be applied to the connecting characters. These strokes cannot begin or end a word. The freedom to stretch and condense letter forms can yield variable results, so an appreciation of aesthetic parameters is important. This elastic device — which does not affect meaning or value — is also used to improve the design of a word in a display position.

Arabic letters do not differentiate between upper and lower case figures: the very concept is completely foreign to Arabic. A word that starts a sentence is written just exactly as it would be if it was in the middle of a sentence, and the letter that begins a proper name is exactly the same as that letter when it begins a common word. On the other hand, an advantage of Arabic is that the alphabet and writing system is closely tailored to fit Arabic phonetics: if all the short vowels and other

diacritical marks are written (as they are, for instance, in all editions of the Qur'an), then every word is pronounced exactly as it is written and written exactly as it is pronounced.

Arabic calligraphy adopted a sloping and curved concatenation model as opposed to the flat baseline of Latin-based scripts. This flowing style, along with diacritical marks, contextual shapes, and ligatures, form essential decorative elements of Arabic handwriting. Nevertheless, the resolution of conventional computer display media is often a limiting factor which prevents accurate reproduction of complex forms.

Automatic typesetting of the Arabic script on nonspecialised equipment becomes, rather, an approximation of an original calligraphic style.

Like other Semitic languages, Arabic is based on what is nominally called a 'consonantal root system'. This means that almost every word in the language is ultimately derived from one or another 'root' (usually a verb) that represents a general, and often quite neutral, concept of an action or state of being. Usually this root consists of three letters. By making changes to these letters, the original root concept is refined and altered. There are many ways to make these changes: letters are added to the beginning of the root or tacked on at the end; the vowels between the consonants of the root are changed; extra consonants are inserted into the middle of the root; syllables are appended to the end. Each of these changes produces a new word — and a new meaning: meanings seem literally to grow out of the root like branches of a tree. But the original, basic idea of the root persists, in one way or another. Because of the emphasis on consonants, it is not surprising that the Arabic alphabet consists almost purely of consonants. In fact, of the twenty-nine letters of the alphabet, twenty-six are consonants, and of the other three, two sometimes stand for consonants as well.

The Origin of Arabic Calligraphy

A wise man has said: "Writing is a spiritual geometry, wrought by a material instrument" And another has said: "Writing is the offspring of thought, the lamp of remembrance, the tongue of him that is far off, and the life of him whose age has been blotted out." Al-Jahiz says: "Writing is a tongue to which the heart runs and is the depository of secrets, the investigator of news, and the preserver of historical memorials." Another has said: "Fine utterances (set out) in elegant handwriting are a pleasure to the eye, and a joy to the heart, and fragrance to the soul." (Arnold, 1928)

The term calligraphy means 'beautiful writing' or 'elegant penmanship' (from the Latin *calligraphia*). Today calligraphy generally refers to the art of beautiful writing as a profession or field of study which is dependent on aesthetic considerations.

Calligraphy is an art which is founded upon a code of geometric and decorative rules. It is an art which, in the patterns which it creates, implies a theory of language and of writing. This art starts off as part of the linguistic structure and institutes an alternative set of rules, derived from language but dramatising and duplicating it by transposing it into visual terms.

Calligraphy in Islamic cultures is highly respected as an art — the art of writing. However, some other cultures might consider calligraphy as penmanship or a craft prettified with floral ornaments or with fanciful decorative additions. This considerable difference illuminates cultural variations. Since arts are products of a culture, the aesthetic principles represent the cultural values. The tip of the pen is what marks the difference between cultures (Khatibi, 1995).

Calligraphy is of course the art of writing, but the practice is by no means universal. Many peoples have not developed it in detail, whereas for others it is regarded as a supreme art. The Arab calligraphers considered that their art was the geometry of the soul expressed through the body — a metaphor that can be taken literally and concretely with the literal design of its inspiring spirit. This metaphor refers back to an established language.

It should be noted here that a codified Arabic calligraphy presupposes the existence of an earlier graphic convention, including diacritical signs and vowels, which was developed gradually both before and after the appearance of Islam, and was applied to the painstaking and laborious task of transcribing the Qur'an. But calligraphy was the work of a hieratic bureaucracy, who were keen to impose on society a political order inspired by the Qur'an. The new discipline was established by Ibn Muqla (discussed later). As a historical phenomenon Arabic calligraphy dates, in its codified form, from Ibn Muqla (ninth century AD), and its decline coincides with the spread of printing. More than ten centuries of calligraphic tradition are represented in this growth and decline of Arabic culture.

The true importance of Arabic calligraphy did not emerge until after the advent of Islam in the seventh century AD. The Arabs' love of language was reflected in the spoken word, particularly in poetry, and the traditional verses and stories were passed from generation to generation verbally, consolidating the great Arabic tradition of story telling. Writing was very much a minority skill to which not much cultural importance was attached. Islamic teaching says that the Qur'an was conveyed to the Prophet Muhammad in Arabic through a series of Divine revelations. The communal Arabic memory could not be relied

upon to retain every detail of the teachings and the consequent need to record every word greatly increased the importance of writing.

Calligraphy reached a high degree of perfection in the Islamic world, where representational art was spurned and Arabic script offered rich possibilities for creative fantasy. Oral tradition was paramount among the Arabs in pre-Islamic days, and poets were the memory of their tribe. Then the Arabs felt the need to write down their stories, first simply as an 'aide-memoire', using only a few signs. With the advent of Islam in the seventh century A.D. writing began to be important because it gave visual form to the word of God. The Qur'an, the first book written in Arabic, played a key role in its development and the evolution of calligraphy.

Throughout the geographical vastness of the Islamic faith, calligraphic styles have united believers and have helped make the Islamic culture distinctive. Whether transmitting the Qur'an or rendering the indigenous language, Arabic script is basic to Islamic culture, and the shapes and characters of its alphabet have permeated every level of society.

Calligraphers were dedicated to their work. Calligraphers often wrote, not at a small table, but seated on the floor, holding the paper on their knees and supporting it with a piece of cardboard. For large manuscripts, however, some alternative had to be found. Calligraphers had to be trained from a young age, sometimes even from childhood; they studied examples called 'mufradat' which had the letters of the alphabet written out singly and in combination with other letters.

Precise practices were laid down. The writing instrument was a sharpened reed still used by calligraphers. The method of sharpening it

was most important, for it varied with different scripts. The ink was prepared with meticulous care and in strict secrecy. The teaching of writing was the responsibility of a master, who began by drawing letters in the sand with his finger. The pupils imitated him, then rubbed it all out and started afresh. Later, smooth wooden tablets coated with clay were used. Each pupil drew a few lines, and then had to keep them until he knew them by heart (Al Baba, 1988).

The Proportional Script of Ibn Muqlah

Calligraphy entered its most glorious phase under the hand of Abu Ali Muhammad Ibn Muqlah (886-940 AD), the true founder of Arabic cursive calligraphy. His genius and knowledge of geometric science brought about the most important single development in the history of Arabic calligraphy (Zakariya, 1978). He used his geometric knowledge to redesign the letterforms using three standard elements: the rhombic dot, the alif and the circle (Figure 4.7). The standard alif was a vertical stroke whose height resulted from a specific number of rhombic dots, created by the width of the reed nib and whose variation depended on the particular style. The standard circle had a diameter equal to the standard alif.

Ibn Muqlah is known as a prophet in the field of handwriting. It has been said that writing was poured upon his hand, even as it was revealed to the bees to make their honey cells hexagonal (Sharaf al Din, 1987). To some later Muslim writers, the high individuality and sometime obfuscation of the early period's calligraphic arts implied disorder. These writers regarded Ibn Muqlah as a figure of heroic stature who laid the basis for a great art upon firm principles and who created the six Arabic styles of writing.

Figure 4.7
The Three Standard Elements of the Proportional Script of Ibn Muqlah:
The Rhombic Dot, the Alif and the Circle

Source: Zakariya, M. (1978). *Observations on Islamic Calligraphy*. Cairo: Dar Al-Nashr.

Ibn Muqlah's achievement represented the adoption of sound geometric principles for calligraphy, and his life exemplified devotion to his art despite great personal suffering. Like many calligraphers, Ibn Muqlah also was a state official. The two roles are intimately connected since good writing was an indispensable tool for anyone aspiring to high governmental rank. Ibn Muqlah's career was stormy. At the age of 22, he was already serving in important posts where he not only practiced his skills as a scribe but also engaged in politics under the Abbassaid caliph in Baghdad. After his political disgrace and replacement in 936 AD, his property was confiscated and he was cruelly imprisoned. Subsequently, his right hand was cut off, a dreadful punishment in itself but particularly horrible for a celebrated master of the word. After still more maltreatment, he died in the summer of 940 AD (Sharaf al Din, 1987).

Ibn Muqlah provided the means for replacing more individual calligraphic inclinations with styles based on ordered, objective, and universally applicable rules. Thus, his khatt al-mansub (proportional script) offered for the first time in Islamic calligraphy a fixed unit of measurement — the rhomboid point of ink left by the pressure of the reed pen in one spot. The upright vertical stroke of the alif was to be measured in its terms. Every letter stood in fixed relation to the alif or the rhomboid point. Script was regulated on geometric principles, and the passion for mathematics and musical harmony which characterised so much of medieval Islamic culture found another outlet in this central Muslim art.

Types and Styles of Arabic Calligraphy

The spread of Islam emphasised the need for legibility and increased speed of writing. The clearer, more efficient cursive forms which had

first appeared in the early years of Islam became more prominent and began to find a use in religious texts. However they lacked the elegance which was to come from improvements in their proportions. At the end of the seventh century, Arabic and its script became official, and were adopted in the administration of all Muslim countries. The script evolved into two main forms, a rounded flowing one called 'Nashk' and a stiff angular one called 'Kufi'. These two styles gave rise to a multitude of others, nearly all named after their place of origin.

In the eighth century the Arabs learned the secret of paper-making from the Chinese, and this encouraged the spread of written texts and fostered the growth of writing. Every corner of the Muslim empire had its own style, reflecting its culture and tastes.

Competition between calligraphers had given rise to dozens of specialised styles. There was one reserved for the caliph, one for ministers, and yet another for messages to princes. There was a style for poetry, one for treaties and contracts, one for finance, one for defence and so on. It was a prosperous time for the profession of calligrapher, which according to Al Baba (1988) had become "the noblest office, the best branch of knowledge and the most profitable estate of the period."

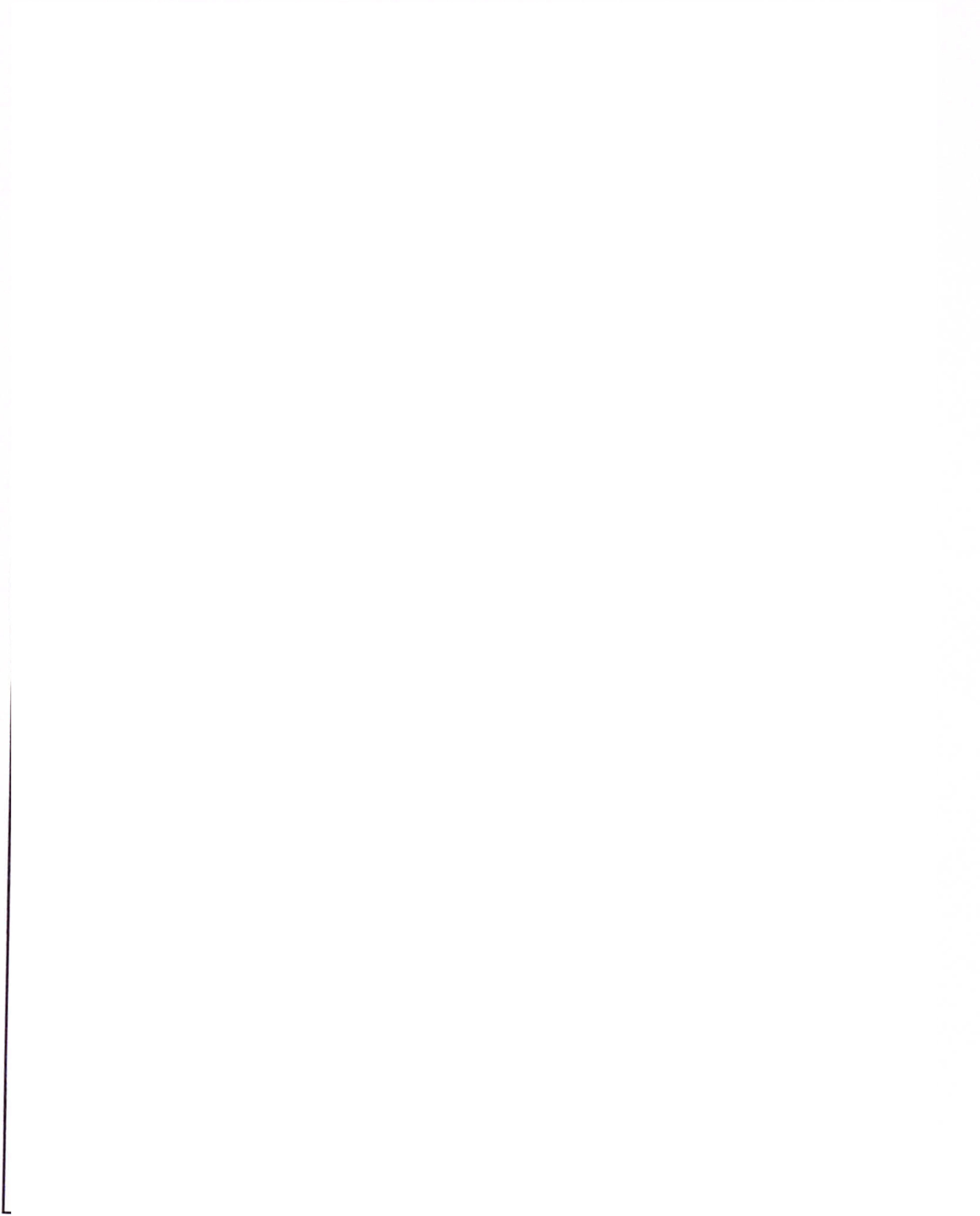
More than 50 cursive styles were in common use. Many of them lacked elegance and were in urgent need of discipline to avoid the inevitable degeneration and proliferation into an endless multiplicity of styles. Most of these styles did not survive long. And the few that have survived to the present time have passed through the meticulous hands of later calligraphers such as Ibn al-Bawwab and Yaqut al-Musta'semi, who subjected them to strict calligraphic rules. Six of these styles came to be known as al-Aqlam al-Sittah (the six pens or six calligraphic

styles). These styles are: Kufi, Naskh, Thuluth, Farsi, Diwani, and Ruqaa (Figure 4.8).

Arabic calligraphy has appeared in many types and styles. It has developed from a simple 'Kufi', which was rather flat, short, and static into a more delicate and longer form, especially since the eleventh century. It was during the Seljik period that Kufic became more elegant in shape. 'Naskh', older than 'Thuluth', this legible script achieved great popularity for Qur'anic use from the tenth century onwards. 'Thuluth' reached maturity in the late ninth century after nearly two hundred years of use. It is still regarded as one of the most important and decorative cursive scripts and is widely used today, in both its calligraphic and typographic forms, for inscriptions and headings. 'Farsi' originated in Iran (then Persia) and spread to Turkey, Pakistan and other areas. Among various derivative scripts created since the late medieval period to meet particular aesthetic requirements were 'Diwani' and 'Ruqaa'. Diwani is an extreme cursive form, the decorative version of which, known as Diwani Jali, is very popular for ornamental texts. It originated in Turkey in the sixteenth century. 'Ruqah', first used in the fifteenth century, only became widely used in the early nineteenth, when posters, newspaper headlines and other secular applications emerged (Haddad, 1991).

Figure 4.8

The Word Allah (God) Illustrated in al-Aqlam al-Sittah
(the Six Pens or Six Calligraphic Styles)



Source: Habash, H. (1992). *Nafaa'es al-Khat al-Arabi*. Beirut: dar al-Qalam.

These six styles can be distinguished one from the other, but as the word calligraphy means beautiful writing, one can notice that the artist had opportunities, within the limits of the existing styles of writing, to create real masterpieces which can be considered as works of non-objective art. For an artist, it is important to notice that the calligraphy used for Qur'anic or religious purposes was based more on geometrical compositions than other types of writing. Religious calligraphy depended on straight lines arranged in verticals opposing horizontals. From this developed a spiritual or expressive connotation of a religious nature.

It is clear that religious calligraphy was influenced by the Islamic concept of an art based on absolute forms and particularly those forms related to static geometrical arrangements. From the geometric religious style developed a secular style with dynamic shapes and more cursive arrangements.

By the end of the fourteenth century Arabic calligraphy had reached exceptionally high standards and had become an important and real characteristic of Islamic arts. Outstanding examples are found in the masterfully decorated pages of the Qur'an (Figure 4.9).

To see Arabic calligraphy that attained a creative standard, one must examine the work displayed in the great mosques or the writing of Qur'anic manuscripts, especially those by the famous artists. In these works the calligrapher has not only been concerned with the style of writing and the meanings of the text but also with technical processes, the distribution of shapes, patterns, lines, and colour, and the unity of the whole composition in the relationship to the parts. The calligrapher, like any modern artist of the twentieth century, has forgotten the basics

of the six styles in order to create new shapes. In this case he showed his sensitivity to the demands of a work of art (Figure 4.10).

In the traditional arts of Islam, Arabic calligraphy was always used as a decorative pattern, sometimes related to geometrical arrangements, sometimes to arabesques, but never as an independent composition. When one does find Arabic letters used independently, it means that they are apt to be used as an artistic cliché in a special style of script. In this case the independent letters usually follow the chosen style of writing and the calligrapher has to stick to that style or his work is considered out of style. What the Arab artist had done in the past was limited to the style of a period and particular schools. He divided the space into different geometrical divisions, then started to organise his calligraphy within the limitations of a particular style.

Some thirty languages have used the Arabic alphabet. The Iranians created their own style, and improved many others. The Ottomans were the last great masters of the art of calligraphy. Their empire saw the introduction of the 'Ijaza', a qualification which entitled the holder to teach calligraphy. It produced some great calligraphers who adapted the various scripts for writing and brought simplicity, purity and grace to calligraphy (Hashim, 1993).

Nowadays, with the development of modern methods of reproduction, contemporary calligraphy has lost part of its *raison d'être*. But it still remains on the look-out for a new way forward, in order to advance the art of writing.

Figure 4.10

Twentieth Century Arabic Calligraphy by Ahmad Mounir

Figure 4.9

A Decorated Page of the Qur'an

Source: Khatibi A. (1995). *The Splendour of Islamic Calligraphy*. London: Thames and Hudson.

Figure 4.10
Twentieth Century Arabic Calligraphy by Ahmed Moustafa



Source: Daines, M. (1996). 'Ahmed Moustafa', *Baseline*, (21) 13.

Calligraphy as an Abstract Art Form

There are only a few scripts which have continuously been practiced and developed since their origin, both for artistic purposes and plain communication. Chinese is an example but Arabic possibly surpasses that language through the richness of its styles of calligraphy. Because of religious inhibitions representational art in the Arabic world has been limited, with the exception of Iran. This has moved the artistic potential of the people into abstract decoration 'arabesque' and lettering in both its inscriptional and written forms.

Once the Arab peoples recognised the necessity to commit their language to writing, they produced in a relatively short time an astonishing calligraphic development, transforming the Arabic script into an artistic medium which best reflected their genius and attracted their best artistic talents (Figure 4.11).

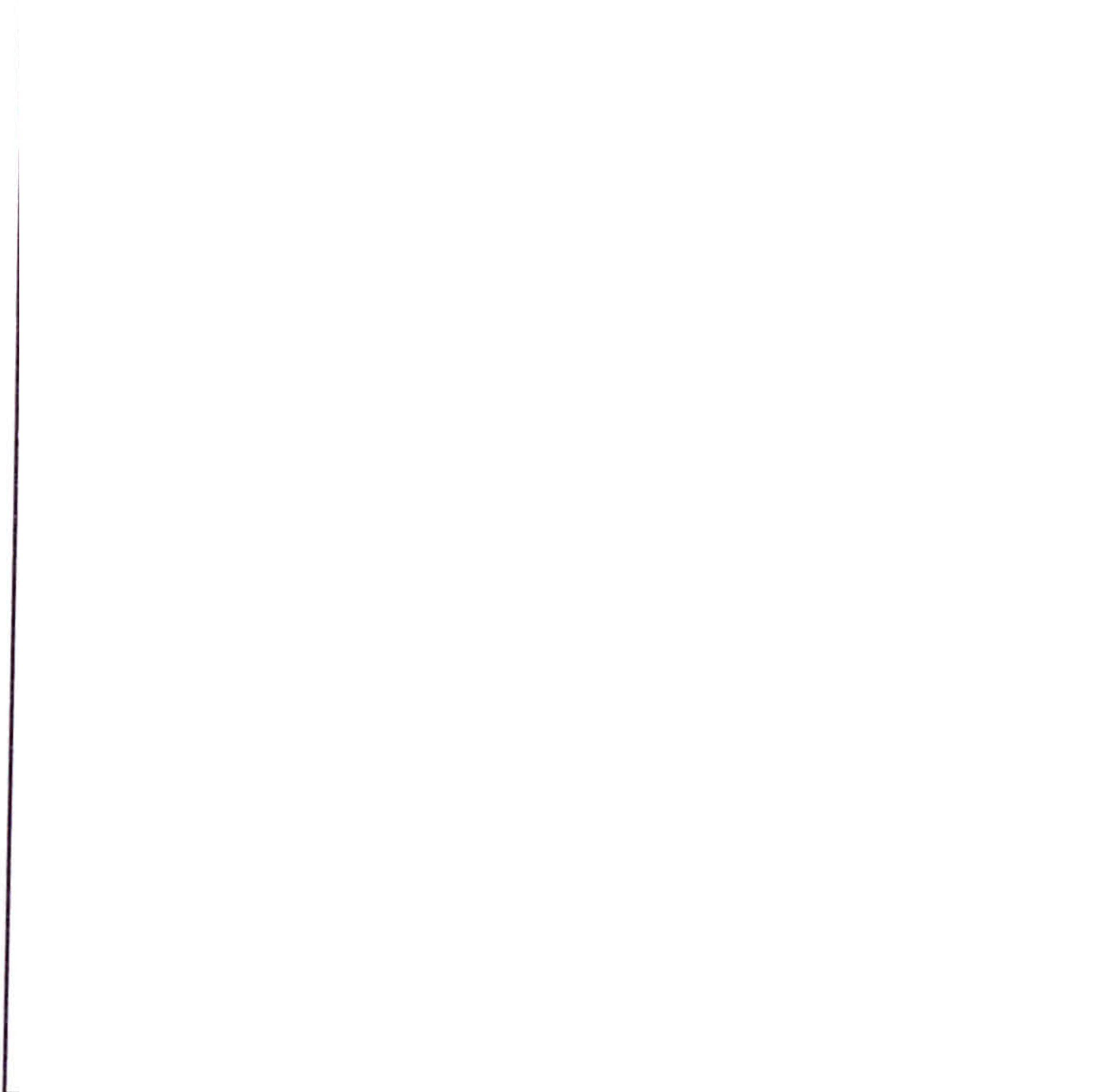
Through his important contribution to Arabic culture the scribe has achieved a high social status, well-deserved after several years apprenticeship to his art. The thick and thin strokes of his lettering result from the chisel nib fashioned from a hollow reed, and the combination of calligraphy with an element of drawing forms the foundation for all the historic shapes of letters (Daines, 1993).

Printed Arabic has traditionally relied on calligraphers for the origination, so a very strong awareness of the aesthetic of letter and word, and indeed page, shapes has evolved. Over the centuries Arabic calligraphy has become an established visual artform. Its gradual development has reached such sophistication that it can become highly abstract (Figure 4.12).

Figure 4.11
The Arabic Script as an Art Form by Sayyid Ali

Source: Safadi, Y. H. (1978). *Islamic Calligraphy*.
London: Thames and Hudson.

Figure 4.12
Arabic Calligraphy: An Established Abstract Art Form



Source: Shahin, H. (1996). *A Collection of Arabic Inscriptions*.
Beirut: Books World.

Arabic calligraphers integrate inner experiences with their experiences of external reality. By imbuing strokes with life and feeling, an equilibrium of energy flows from all composing elements. A calligrapher's integration of inner and external realities results in a very personalised style and is accompanied by concentrated and unremitting scholarly study. The development of a calligraphy style is as unique as the calligrapher's personality, and its achievement is considered as the representation of the individual's self-cultivation.

In almost all of the Arabic scripts, the spacing between lines and words overflows with a sense of freedom and a flexibility which reveals the creativity and spontaneity of the calligrapher. Through the calligraphy's momentum and sense of balance, a tranquil harmony is achieved that immediately appeals to the mind and to the heart.

Arabic calligraphy is a symbol representing beauty and power, and its stylisation is an integration of artistry and scholarship. Through the abstract beauty of the lines, energy flows in and between the lines and words. And this integrates all constituents into a whole. These constituents include positive spacing which refers to lines; negative spacing which refers to blank space between lines and on the page; and the energy flowing through interweave sophisticated rendering of the calligrapher. Since the flow of energy as a unifying element in every work of Arabic calligraphy is not visible in a concrete sense, the perception and interpretation of this aesthetic principle is sometimes hard to grasp for people from other cultures. Consequently, the abstract beauty of Arabic calligraphy reveals itself to the informed eye and may not be easily comprehended by those who try to approach it through technical or analytical methodology (Al Zahab, 1994).

Calligraphy became an object of meditation. Complicated geometrical constructions known as calligrams became illegible. Calligraphy thus became an abstract art form, expressing the feelings of the calligrapher

which the observer could interpret as he or she wished. It developed in two main directions. First, the shape of the letters themselves — sloping up, sloping down or lying down — required calligraphers to be extremely meticulous. The shape varied according to whether the letter was at the beginning, in the middle or at the end of the word. Letters were nearly always joined up; and the space they had to fit into needed to be carefully measured.

The second line of development was the calligrapher's own imagination. The accepted rules did not exclude innovation. After spending years studying the legacy of his forebears, an artist eventually gave his inspiration free rein; and it was by breaking the rules that he advanced his art. "When the pen becomes a tyrant, it binds together that which was separate and separates that which was bound together." (Habash, 1992)

The Usage of Words in Islamic Culture

Arabic calligraphy is not merely an art form but involves divine and moral representations — from which calligraphy acquires its sublime reputation. While most faiths have made use of figural images to convey their core convictions, Islam's early theocracy chose words (letters) and their shapes and sizes. Because Islam saw in figural arts a possible implication of idolatry, Islam looked instead to the artistry of calligraphy for religious expression. Safadi, (1992) writes:

The primacy of the word in Islam is reflected in the virtually universal application of calligraphy. Writing is given pride of place on all kinds of objects — objects of everyday use as well as entire wall surface, mosque furniture, the interiors and exteriors of mosques, tombs, and al-Ka'ba, the most famous sanctuary of Islam.

But like the icons of most other faiths, script also represents power. Its preeminent use is the writing of the divine message of the Qur'an, of course, which endowed it with extraordinary strength and transcendent significance. From this world's manifold possibilities, Allah (God) had chosen Arabic as the vehicle for his final revelation (Welch, 1979). The primary reason for the chronological, social, and geographic persuasiveness of the calligraphic arts in the Islamic world is found in the Qur'an.

Writing in Islamic culture gained its respectable and honourable position because of the Qur'an which is considered as the Book of God, descended on prophet Muhammad. When the calligraphers started the art of the book, or when they wrote Qur'anic images, their craft became an honourable task, and Arabic calligraphy in Islamic culture became the symbol of Islam and the Islamic nations. The use of Arabic words in the Qur'anic verses and the use of the pen was honourable because it was mentioned in the Qur'an.

“By the Pen and what they write” (Qur'an. IXVIII).
“Recite, thy Lord is the most generous, who has taught by means of the pen, has taught man what he knew not”
(Qur'an. XCVI).

These verses refer to the attainment of knowledge in general, and particularly to that gained from revelation as found in the Qur'an. The written form of the Qur'an is the visual equivalent of the eternal Qur'an. The Holiness of the Qur'an lends a special aura to all forms of the written word. Janson (1962) describes the influence of Qur'anic images and ideas:

The Qur'an remained the calligraphers' domain, as it had been from the very beginning of Islam. In their hands, Arabic lettering became an amazingly flexible set of shapes, capable of an infinite variety of decorative elaborations, both geometric and curvilinear. At their best, these designs are masterpieces of the disciplined imagination that seems to anticipate, in a strange way, the abstract art of our time.

The art of beautiful writing originally arose from the desire to give clear and appropriate form to the words of the Qur'an. Revealed in Arabic to the prophet Muhammad, this text is the core of the faith, and the alphabet with which it is recorded is thus invested with religious significance.

In copying the holy text, the scribe strove for both accuracy and beauty. Gradually, diacritical marks were developed to clarify the text, while gilded illumination and chapter headings were applied to enhance the appearance of the manuscript. By transcribing the words in a flowing hand, the calligrapher emphasised the meaning of the words with his artistry.

Calligraphy evolved as the art of Islam partially because of the tremendous flexibility and visual potential of the Arabic alphabet. Its 28 letters derive from a limited number of basic shapes which can be executed in a wide range of styles. The scribe might make the forms monumental or small, stately or hurried, depending on his purpose. For copying the Qur'an, scripts of a majestic, clear appearance developed while more informal styles evolved for other manuscripts and record keeping.

For each style, the calligrapher would use a reed pen of the appropriate size and cut, keeping a wide selection in an elaborate box made of

metal, wood, or paint. More than one script might be employed on a given page to distinguish different parts of a text. Mastering the styles was an arduous task, complicated by the belief that only the pure in spirit could write flawlessly. The aspiring calligrapher took comfort, however, in knowing that if he wrote the bismillah (the dedication to God) beautifully, God would pardon his sins (Afifi, 1990).

Calligraphy was not confined to the manuscript page but was adapted for use on buildings, fabrics, and objects of all kinds. Written right to left, the words could be rendered in straight lines, circles, squares, and interlaced patterns; individual letters might be embellished with leaf forms, braided into knots, or animated with human and animal faces. This decorative repertoire forms one of the great achievements of Muslim artists (Michell, 1978).

Whether the texts are inscribed, painted, carved, or woven, they convey a variety of messages. Some are Qur'anic quotations of general import, while others refer to the specific function of the object or building on which they appear. Still other inscriptions include the names of patrons and craftsmen, or the date of completion. Formulaic phrases are commonly used to bless an anonymous owner or venerate a ruler of the time. Simple and extensive poetic verses also appear. Occasionally illegible strokes seem only to resemble the Arabic script.

Some inscriptions of amazing intricacy simply defy easy reading; others, placed at a great height, or in an inaccessible location, cannot have been intended to be read. The visual impact of the script itself remains undiminished, and the art becomes virtually the symbol of the faith, conveying the essential message of Islam by its appearance alone.

The status of this subtle and demanding art implies great respect for the men who create it. Calligraphers' names have been recorded and their works were collected and treasured throughout the Muslim world. Samples by the great masters were framed in gold and compiled in albums to be admired at leisure by the bibliophile and connoisseur. For students and researchers, such collections provided the models and inspiration for the exacting task of perfecting a beautiful hand.

Today, the traditional chain of master calligraphers teaching younger scribes continues, though it is somewhat weakened by demands of the modern world. Nevertheless, calligraphy is still used to adorn buildings and objects, and it remains a vital art form in the Muslim world.

Meaning and the Written Word

Language gives evidence of its reality through three categories of human experience. The first may be considered as the meanings of words; the second, as those meanings enshrined in grammatical forms; and the third and the most significant as those meanings which lie beyond grammatical forms, those meanings mysteriously and miraculously revealed to man.... Language as the power of universals is given to man in order that he may transcend his environment, in order that he may have a world. It is the law of language to create the world (Anshen, 1957).

Calligraphy is the art of the linear graphic; it restructures one's visualisation of a language and its topography. In this sense, calligraphy in the Arabic language is constructed on a simple spatial principle: the Arabic alphabet is written in the interplay of a horizontal base line and the vertical lines of its consonants. It is read from right to left, with the addition of vowels, diacriticals and loops which are positioned variously above and below the base line. The originality of this written form, which in some respects has no equal, is created by the architecture and rhythm of the letters. Here the force of the 'arabesque'

as a plastic form is recognised.

Calligraphy can be seen as a reading and a writing in the second degree. It obeys a geometry of the spirit that is created in the opening of a space between the statement contained in a phrase and its realisation as a work of art. This happens within the heart of every word, every phoneme, right down to the noiseless musical quality of the text as a whole, rendered by the calligrapher's art in the form of light and shade, the readable and the elusive, the impression of what one sees and the presence of the voice. (Khatibi, 1995).

Calligraphy reveals the plastic scenography of a text: that of a letter turned into image, caught in the physical act of creating a line which is animated and led onwards by an inner rhythm. This art works by taking a text as a score consisting of strokes created by the graphic artist. For the language which practices it, and which thereby gains beauty, the calligraphic art constitutes a laboratory of signs. As in the case of Chinese and Japanese writing, the Arabic script derives from a civilisation of signs. By 'sign' it is meant in this context a conventional mark, arbitrary in relation to the thing designated, which serves to convey the sound of the spoken language.

What calligraphy does is to take the written sign and alter its form and decorative style by changing the treatment of line. This plastic form simultaneously serves both the meaning of the actual statement and the composition of images, of letters which are recreated as image. The actual meaning of the statement here becomes secondary, so that the imagined reader is like a dreamer awakened, whose vision is woven within a context of art (Khatibi, 1995).

The characteristic aspect of this Islamic cultivation of signs and symbols is the preeminence of the art of ornamentation. It should be

remembered that during the classical Arab era (the ninth and tenth centuries AD) the visual arts embraced the arts of the book (illumination, fine bindings and calligraphy itself), architecture (mosques, religious schools) and the everyday applied arts such as ceramics, carpet-weaving, mosaics and leatherwork.

Graphic systems may be more or less beautiful in their conception. And, as in every art, calligraphy may be arrived at by skill or by serendipity and improvisation. As indicated above, the Arabic system of writing is created from a range of signs and their variants, combining elements of the vertical and the horizontal. It also features diacritical marks, the loops which make up the bodies of letters, and the connecting links between them. Letters may be joined together or they may stand alone.

Given that this calligraphy derives from an ancient Semitic alphabet, it is no surprise to find that it still retains pictographic elements.

However, the alphabet has evolved greatly since the early manuscripts of the Qur'an. It has embraced many forms of ornamentation and decoration, so that the letter recreated as image has become an essential paradigm of the arabesque. Initially an art confined to books, Arabic calligraphy has gone on to adapt itself wonderfully to other media: stone, stucco, mosaics, ceramics. This iconic transformation has only been possible by the nature of this system of writing.

Calligraphy thus has its own sculptural autonomy as an art which is extremely abstract, and within which one can discern a geometry, even a mathematical quality, of the sign. For example, the simple dot, which signified nought among the Arabs of ancient times who invented it, came to serve as the means of indicating the diacriticals which distinguish various letters which have the same shape. Professional

calligraphers adopted the dot as a module in developing different calligraphic styles.

The letter recreated as image follows three rules of composition: phonetic, semantic and plastic. Calligraphers create their compositions by joining letters together, and by adding vowels and diacriticals. Thus they give supplementary form to the meaning of the text which one is reading.

The essence of calligraphy lies in its relation to language. Although the aims of the art of the calligrapher and that of the painter who incorporates words or letters into his work may sometimes be the same, the two complement each other in the way that the written character is given meaning and life. Calligraphy allowed the artist to list himself as a scribe rather than a painter (mussawer) as described by Janson (1962):

To a Moslem the calling of scribe was an ancient and honourable one; a skilled calligrapher might do pictures if the text demanded them, without having to feel that this incidental activity stamped him as a painter.

A problem may face those who do not read Arabic, since they cannot follow the Arabic themes in calligraphic art; a similar difficulty would face the Arabs who cannot read Arabic and only speak it. Words are only meaningful as a means of communication when they reach a reader. But, when used as calligraphy, words have shapes and colours that can have a direct effect on those who cannot understand the meanings. Thus, even those who cannot read the words have a share in the communication; they will be able to react to the expressive quality and colour of the forms. Those who are experienced in art and, at the same time, can read Arabic will be able to 'read' the work of art in the same way as they read a book.

Words presented in calligraphic script are, of course, different than they would be in simple content. The calligraphy puts the emphasis on the formal and expressive qualities of the shapes. The words can be presented as part of the composition of abstract shapes in the picture. They can be presented in varied size and positions, with lines running in different directions, with colours that are in contrasted and harmonic units, and with textures of high or low key; they can be presented in spatial contexts either as voids or solids.

These formal involvements need not prevent the artwork from being a means of communication that carries a message to the people whether they can or cannot read the words or appreciate the symbolic connotation of the forms. 'Artistic activity', even if it aims at creating stable and universal values, is always directed to a particular society or at least to a particular public (Encyclopaedia of World Art, 1963).

Communication through calligraphic art depends on the particular experience and mentality of the spectator. When contemporary calligraphers created their work they intended them to embody both local and universal values. They have kept in mind that their work cannot be directed only to the Arab people but must also be directed to those of different cultures and traditions.

The Typographic Evolution of the Arabic Script

"Beautiful writing increases the truth in clarity," observed Prophet Muhammad. Thus ennobled and sanctified, the Arabic alphabet became one of the most venerated scripts in world history. Yet it is this halo of sanctity, both religious and aesthetic that modern Arabs have come to challenge. They have realised that the script, they inherited from their forefathers is deceptively complex and its acclaimed shorthand

appearance is hardly suitable for typographic and printing needs. The challenges and the grievances which were raised against it will be explored in this section.

Like other scripts in the Semitic family, the Arabic script is consonantal. That is, it is equipped with letters for consonants and some long vowels but none for short vowels. This 'scriptio defectiva', as Blachère (1959) calls it, came to Arabia at a time (6th century) when the art of reciting and declaiming poetry by heart was at its height. It was a time when the Arabs were under the 'absolute domination of memory' (Blachère, 1959).

By the time the Prophet Muhammad began preaching in Mecca the art of writing was fairly well known to his scribes. But the tendency to commit everything to memory was so strong that the early Muslims were initially reluctant to write the Qur'an down. They learned the Holy Book by heart and transmitted it orally. When they finally decided to commit the Scripture to writing, the primitive writing they had inherited was used as a makeshift at best. It took them almost two centuries to perfect it and make it commensurate with the 'Word of God'.

As Islam spread, the task of improving the script became more and more imperative. The great conquests of the first century Hegrah (7th century A.D.) led to an increasing number of non-Arab converts and engendered more and more scribal work in the state bureaus of the capital, Madinah. With the establishment of the language of the 'dawawin' (the official language) concern for correct speech and good penmanship became increasingly important. This concern did not reduce the widespread errors and mistakes committed by Arab as well

as non-Arab Muslims in reading the Qur'an. In order to improve the script which was blamed for poor reading, the religious leaders and philologists took measures which a century later made the Arabic script what it is today.

As a rule they were guided by the intellectual or social level of their prospective readers, relative to the latter's own professional or official positions. Authors of textbooks for the young and handbooks for the relatively inexperienced would-be professionals were more apt to make liberal use of orthography. On the other hand, authors of manuscripts intended for the cultured class, for professional peers, and for official superiors would limit orthographic symbols to a minimum, thus tacitly flattering the recipient by implying his full command of the language. Inadvertent or intentional disregard of this guideline was likely to bring indignant protests or disapproval. (Abott, 1972)

A Summary of Arabic Script and Printing Difficulties

From the foregoing we see that to the uninitiated, Arabic script exhibits a number of unusual and confusing features.

- The basic alphabet consists of a set of 28 letters, representing mainly the consonants and a few long vowels. It is extended to some 90 elements by additional shapes, marks, and vowels formally recognised in the Arabic morphology. Arabic letters, written in elegant cursive forms, do not differentiate between upper and lower case figures.
- A large number of diacritical signs, which are similar to accent marks of European languages, are used to mark short vowels and emphasise or loosen a letter's sound. These marks can be mixed and written above or below the characters to produce composite phonetic effects.
- Arabic script, which evolved in contemplation of the traditions of

handwriting, is context sensitive. The shape of most of the characters depends on their position within a word and the characters adjacent to them. Each character may be represented up to four different ways of which only one would be correct in a particular situation.

— Moreover, many of these intermediary forms depend on the adopted calligraphic style. As an extreme case of contextual reshaping, Arabic script allows ligatures between characters. In other words, adjacent letters can be fused to produce new graphical forms. In order to emulate handwriting, approximately 400 ligatures are available, yet only three of them have mandatory usage.

— Orientation of the Arabic script is from right to left, but Arabic numerals are written and read from left to right. Unlike Latin-based alphabets, elements of the Arabic script convey directional semantics, which control the orientation of a typesetting process (a more detailed discussion is presented in Chapter 7).

Arabic calligraphy adopted a sloping and curved concatenation model as opposed to the flat baseline of Latin-based scripts. This flowing style, along with diacritical marks, contextual shapes, and ligatures, form essential decorative elements of the Arabic handwriting. Nevertheless, the resolution of conventional computer display media is often a limiting factor which prevents accurate reproduction of complex forms. Automatic typesetting of the Arabic script on nonspecialised equipment becomes, rather, an approximation of an original calligraphic style.

In the Latin alphabet there have existed since the 15th century, two distinct types of letters: one for handwriting and one for printing. The Arabic alphabet, on the other hand, has only one type of writing, the

cursive manuscript writing in which the letters are connected or non-connected according to a set of rules. There are no letters for printing Arabic. The Arabic print character is not designed according to the geometric constraints of typesetting machines but according to a well-established aesthetic tradition, in which functionality, standardisation, and legibility are sacrificed for calligraphic elegance.

In order to compose a text using the Latin alphabet, only a minimum of 52 letters are needed (26 lower case and 26 upper case) to which a dozen punctuation signs and the 10 numerals are added. Thus the type font of Latin characters never exceeds 120 types. Although the Arabic alphabet has no upper case letters, the 28 letters it comprises present major difficulties in composing a text because the code of liaisons has created, just like in any manuscript writing, numerous ligatures and a multitude of forms for every letter.

This reason accounts for the absence of letters adaptable to printing purposes. They also explain why as many as 117 characters are needed to compose the consonants of the traditional alphabet, a figure which does not include the ligatures, the vocalisation and punctuation signs, nor the numerals. The overall minimum number of characters required to print Arabic is 280 (Mackay, 1990).

In order for any Arabic text to have the same orthographic precision as any text written in a Latin language, additional signs have to be included. Unlike Latin writing which is almost horizontal, the vocalised Arabic writing is at the same time horizontal (consonants are juxtaposed from right to left) and vertical (vocalisation is placed above and below the consonants). This has constituted a problem for the standard mechanical processes of text composition which allow only a

strict juxtaposition of characters, and this explains why Arab printers generally avoided vocalisation. When vocalisation became necessary (for elementary schools and in didactic materials) the vowel signs were usually handwritten on the proof of the film of the consonantal text already mechanically composed. Once vocalised, the text was run off on an offset machine, a job which required a laboratory and adequate personnel, including a calligrapher-retoucher.

The plurality of letter shapes and the ligatures account for the enormous matrices one encounters in Arabic printing shops. When the printing press was invented in the middle of the 15th century, the Europeans used it at first to reproduce the Roman cursive handwritten manuscripts. This practice was soon abandoned in favour of printing the characters in their isolated, movable rather than connected form in order to cut down on the number of types, the labour, and the cost involved. In the Arab world and elsewhere where the Arabic script is used, the practice is still to reproduce faithfully the penman's cursive strokes. Although the Arabic alphabet contains only 28 separate values and there is no distinction between upper and lower case characters, it takes a minimum of 120 separate, hot-lead types to produce the most starkly, utilitarian and unaesthetic form of Arabic script. To achieve a low average standard of design and legibility it takes between 280 and 450 types as compared with 70 used to print an English or a French text. In some matrices, the number of characters can be as high as 600 separate types. The use of such a matrix involves high labour cost, complicates and slows down typesetting and proofreading. In North America and some European countries, orientalist journals had consented to print Chinese, for example, but had refused Arabic script texts. Despite the progress made in the West in photocomposition and computer-assisted typesetting, the cost of printing an Arabic text has

been still expensive (Mackay, 1990).

The real defect that has plagued the Arabic writing system for centuries and is blamed for the aversion Arab readers have towards Arabic is the absence of vocalic diacritics from the printed text. Arabic has six vowels, three short and three long. Although the latter three are incorporated in the body of the word, the short vowels are placed above or below it. Most Arabs find writing them cumbersome. It requires the writer to constantly interrupt the flow of writing and go back to the beginning of the word to place them, or misplace them, in which case it does not make what he writes any easier to read. So it has become customary to omit the short vowels as one writes.

As for printing, the matter is even more complex. The already unwieldy matrix needed to print unvocalised Arabic texts does not allow a liberal use of diacritics. So the printing press has come to regard these diacritics including the short vowels as rather an unnecessary and heavy burden that demands arduous work and expert labour. Therefore, the use of short vowels has been confined to printing Qur'anic texts, children's literature and literacy materials, and only a handful of subsidised printing presses would undertake such a difficult task.

Strangely and interestingly enough the practice of using the vowels for the sole benefit of the learner rather than the teacher or the literate has given rise to what Taymour (1952) calls "an unfortunate and misguided conception amongst the educated classes — a strange complex against diacritical points and a sense of superiority to them."

And so, to present an educated man with a book printed with diacritical points has come to be regarded as something in

the nature of an insult, and an imputation of ignorance of the rules of syntax and conjugation, ...The writing of Arabic without diacritical points is a defective form of writing and...in refraining from the use of the diacritical points we are only showing conceit. (Taymour, 1952).

Orthographic Reforms

The Arabs' concern over the adequacy of their writing system came as a result of the frustration some educators have experienced in transmitting the Arabic language accurately and to everybody. Over the last three decades, the feeling among these educators had become very strong; the prodigious efforts they were exerting in filling the terminological gaps, simplifying the structure of the language, and arabising school subjects were being constantly thwarted by a defective script.

As a manifestation of self appraisal and search for effective means to revive the Arabic language, modern Arab educators and linguists alike have looked at their writing system with critical scrutiny. The defects they have ascribed to it — mainly the absence of short vowels and the plurality of shapes for each letter — were considered an impediment to genuine literacy and educational progress. Despite the grievances which were raised against the Arabic writing system, and the lack of empirical research to substantiate them, most of these educators still believe that the writing system must be simplified or changed if correct reading and effective printing are to be achievable.

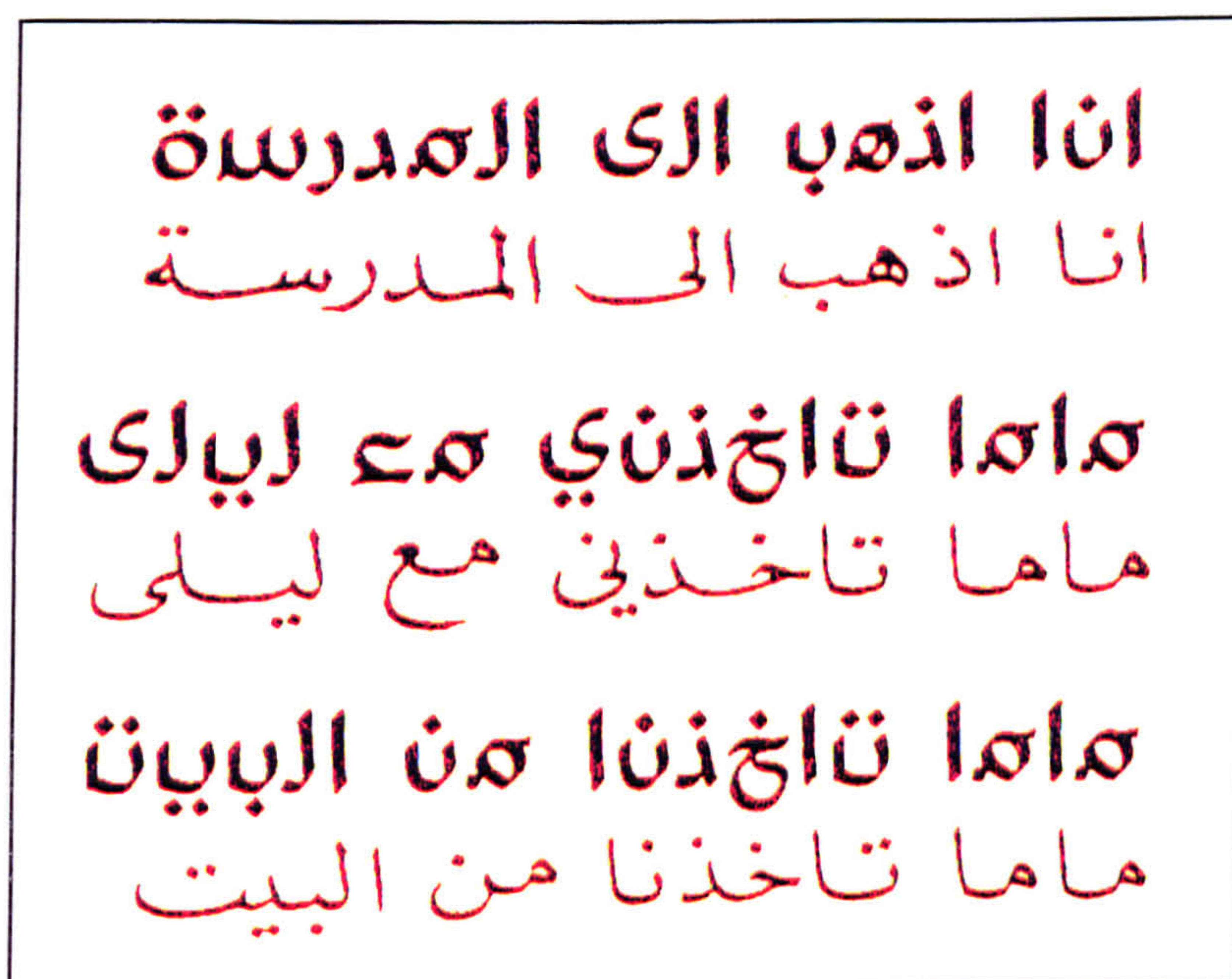
The Unified Arabic Type

The main objective of Arabic orthographic reformers was to find an alphabet that would facilitate the use of diacritical points in the printing press. Khattar (1949), a Lebanese architect, advocated the use of only one form of any letter so that there would be not more than 28 different

forms in the matrix instead of the present 400 or more. The present diacritical points would then be added to this greatly diminished matrix without undue burden.

Khattar (1949) called his new alphabet 'unified' because the initial, medial, final, and stand alone letters have been unified into one standard and highly legible form (Figure 4.13). Each of the new forms has retained the essential identifying traits of the old variant forms. He maintained that the more than 400 characters of the present system could and should have numbered only 28. His use of the 28 letters enabled him to use liberally the diacritical marks. The main advantage of this unified type, beside standardising the shapes of the letters, is that it makes it possible to print Arabic in type sizes as small as English. Moreover, a book which in traditional Arabic type would require 500 pages could be printed in less than 100 pages in unified type with an increase in legibility (Khattar, 1949).

Figure 4.13
The Unified Type of Nasri Khattar



Despite Khattar's far reaching campaign in publicising his new alphabet, his proposal had little appeal. Several weaknesses have been pointed out with regard to the unified type, chief among which are the following:

1. The solution predicated by Khattar is based on the Roman alphabet concept of juxtaposing movable, isolated types. This, according to Sauvaget (1951) is a flagrant departure from the traditional Arabic characters and amounts to a 'disguised romanisation' of the Arabic alphabet.
2. Sauvaget (1951) also believes that Khattar's new type would force the child to master two forms of characters, one for reading and one for handwriting. The two forms, he adds, are so far apart that the transition from one to the other cannot be easily achieved.

Khattar had anticipated this argument and had stated that his proposed alphabet does not replace but complements the handwritten script and that Arabic would not only have a style for handwriting in which the letters are connected to each other, but another style, like European languages, for printing in which the letters are disconnected. Although Sauvaget's last objection and Khattar's answer to it seem plausible, it has not been shown experimentally that the transition between the two forms of writing is indeed an impediment to learning as Sauvaget has claimed; or that they can coexist advantageously and promote literacy as Khattar had claimed.

Perhaps the most important weakness that has led to shelve Khattar's project, despite its technical and pedagogical promises, is that Khattar attempted to dissociate two essential, historically and culturally interrelated aspects of the Arabic alphabet. These are, up to the present, considered by most Arabs as an organic, indivisible whole. The two

aspects are: (a) the linguistic aspect, that is, the Arabic alphabet as a code, a system of symbols designed to represent graphemically the sounds of the language; and (b) the aesthetic aspect, that is to say, the alphabet is considered as an object of artistic excellence.

Khattar (1949) reduced the Arabic alphabet to its stark, utilitarian, functional role. Although this would greatly simplify and improve the printing of Arabic texts, the juxtaposition of clear, standardised types simply failed to appeal. And as long as the Arabs' perception of the role of their alphabet remains unchanged, any reform which favours or insists on the first aspect at the expense of the second is bound to remain 'ink on paper'.

The Adaptation to Printing Technology

Whatever the processes, the techniques, or the machines which are used, the Arabic language printer cannot compete with printers of European languages. That is, "he cannot work fast, well, at a minimum cost, and still satisfy the demands of the public" (Lakhdar, 1977). These four exigencies, according to Lakhdar (1977), cannot be met all at the same time simply because the typesetting or composition of Arabic texts often calls for makeshift measures, none of which are practical or profitable. These include:

1. modifying the performance of the machine in order to reproduce the unwieldy Arabic characters.
2. sacrificing some of the signs necessary for reading (usually the vowels) in order to make the work of the machine profitable.
3. modifying the standard material through the annexation of costly elements such as an auxiliary keyboard to complement the work of regular typesetting machines or a special computer program added to

the regular electronic photocomposers.

Neither the graphic facts presented above nor the proposed solutions of past reformers have succeeded in modifying the Arabic alphabet or replacing it. According to Lakhdar (1977), the majority of researchers who tried to reform Arabic printing did not distinguish clearly between writing as a code or signs, as calligraphy, and as the drawing of types — a graphic art which combines mechanical drawing and draftsmanship. The confusion of these three levels has led researchers to propose two different types of reforms. On the one hand, there are those who proposed that the Arabic letter be replaced by isolated printed characters (Khattar's proposal) as is the case of the Latin alphabet. This, Lakhdar maintains, is inadmissible for two reasons. The first is that the present writing system is 'admirably' adapted to the morphology of the language. Modifying the code of liaisons would result in the loss of 'morphological legibility'. The second is that such a change would break the link with the past written tradition and calligraphic heritage. on the other hand, there are those reforms which, while preserving the calligraphic writing, have sought to resolve the technical problems posed by its reproduction by proposing different types of machines. The main error these reformers have frequently committed is their disregard for the intrinsic capabilities of printing machines and their attempt to adapt these machines to cursive writing at any cost.

Aware of these errors, Lakhdar (1977) has tried from the outset to avoid them by putting forth the following two conditions which, he says, must constrain any reform:

1. The traditional cultural aspect of the Arabic alphabet must be preserved because it is intimately linked to the very structure of the

language and to its written tradition.

2. The Arabic orthography must adapt itself to the existing printing technology rather than the printing technology to the orthography.

Although the first condition has been observed by reformers, the fulfilment of the second one turned out to be the major achievement (Khattar's proposal). The Arab reader, be he a layman or a specialist in printing, often complains of the lack of legibility of the Arabic printed word. Yet when he is called upon to appreciate a graphic innovation, he judges it on its aesthetic values rather than its legibility, his sole criteria being, obviously, calligraphy. Lakhdar insists that the new typographic characters are not calligraphy, nor even a remote imitation of it. They are Arabic letters intended for reproduction techniques rather than for handwriting. They are functional letters designed for printing. The criteria for appreciating a printing type regardless of the alphabet are: functionality, legibility, and harmony of style.

1. Functionality: Does the character perform or serve its function which is to transcribe the written message in an economical, simple, clear, and complete form?

2. Legibility: Is the character legible, i.e., are its elements well designed for an immediate, total grasp without undue stress to the eye of the reader as he or she glances across the page of a book, a newspaper, a brochure, or a poster?

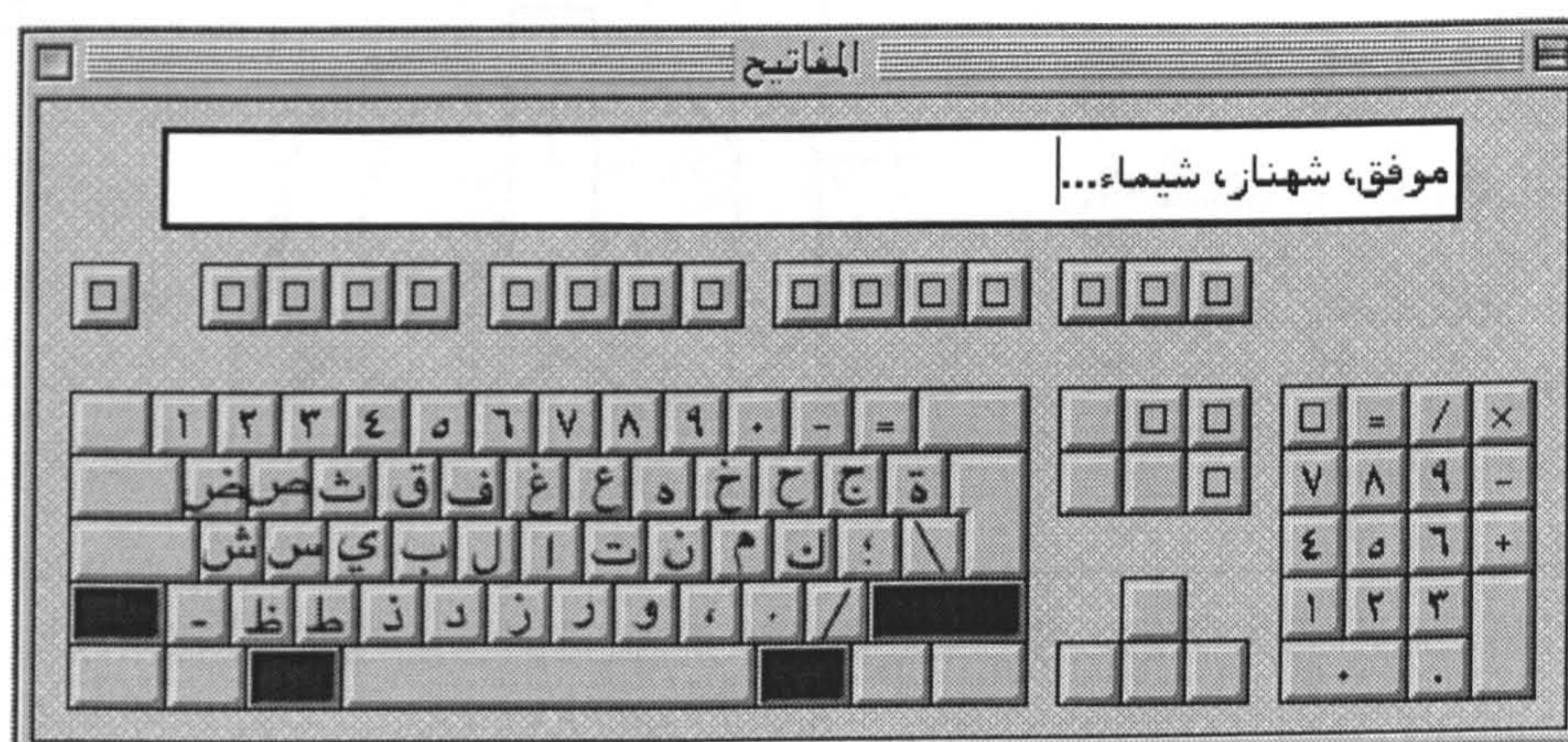
3. Harmony of style: Is there a visual harmony of the whole?

The Linguistic Computation of Arabic

Modern printing equipment based on raster lines — in which hot metal type has been replaced by purely combinatorial patterns of zeros and ones which specify the desired position of ink in a discrete way —

makes mathematics and computer science increasingly relevant to printing, and thus bringing the Arabic script for the first time to the age of the computer. Digital typesetting system encodes Arabic characters digitally on a grid, defining the shape of each letter as a certain number of distinct points. Every detail of a letter is defined, including horizontal strokes, vertical strokes, and curves. The coded characters are stored electronically as digital instructions designating the x and y coordinates of the character on the grid. These instructions are then sent to a microprocessor via a keyboard, where the character is generated onto the screen (Figure 4.14).

Figure 4.14
The Arabic Keyboard

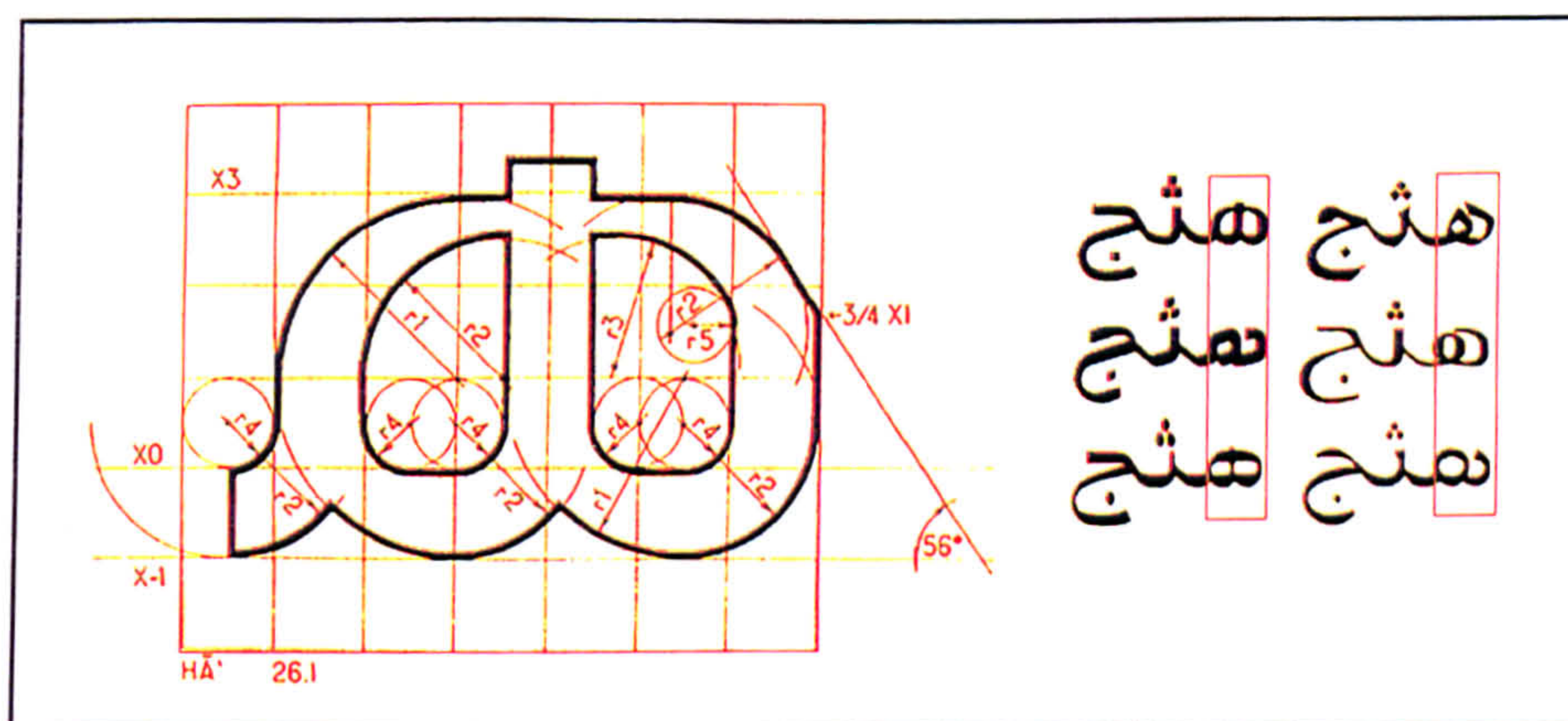


Perhaps one of the most exciting and innovative breakthroughs in digital typography is Knuth's (1986) invention of METAFONT — a system for the design of alphabets suited to raster-based devices which print or display text. This technology has significantly contributed to the digitisation of Arabic typesetting which makes it possible to give a completely precise definition of letter shapes which will produce essentially equivalent results on all raster-based machines. Furthermore it is possible to define infinitely many styles of type at once; computers

can 'draw' new fonts of characters in seconds, so that a designer is able to perform valuable experiments which were previously unthinkable.

A METAFONT user writes a 'program' for each letter or other symbol which is desired. Ideally the programs will be expressed in terms of variable parameters, so that a wide variety of typefaces can be obtained, simply by changing the parameters (Figure 4.15).

Figure 4.15
The Variable Parameters of an Arabic Letter



It is harder to write a METAFONT program than to draw a character with pen and ink, but once the program has been written it is easy to 'parameterise' it so that the letter shapes will adapt themselves to different specifications. And it is easier to write a METAFONT program than to draw a character ten times. Therefore METAFONT is usually used to provide an entire family of related fonts. By varying the programs and the parameters, a designer is able to determine the most pleasing settings.

METAFONT programs are expressed in a declarative algebraic language which is rather different from ordinary computer languages, since it has been developed especially for the problems of type design. In this language a designer or a typographer explains where the major components of a desired shape are located, and specifies how the shape is to be drawn using 'pens' and 'erasers'. One of the advantages of METAFONT is that it provides a discipline according to which the principles of a particular alphabet design are stated explicitly — the underlying intelligence does not remain hidden in the mind of the designer, it is spelled out in the programs. Thus it is comparatively easy to obtain consistency where consistency is desirable, and to extend a font to new symbols which are compatible with existing ones. Thus, this standard computer language provides the following:

- understands typography from individual characters to page design;
- permits any typewriter, word processing system, computer-based editor to be used as an input device with a standard language;
- can typeset various formats and languages;
- is structured to be user-extendable to virtually all applications.

It is this generality and segmentation of function that makes this system significant to the Arabic Script.

Ironically enough, typesetting is an activity that is of an optical nature based on subjective visual criteria and not one based on scientific or mathematical principles. As an aesthetic consideration, this is a pertinent factor in that the ability to manipulate the type to this degree can result in some truly wonderful effects but when done without the utmost sensitivity can greatly diminish the integrity of the type in its original and intended form. When the traditional cursive script is

adapted to printing type the variant forms of the letters result in a much greater number of alphabet characters to which figures, punctuation, and other characters must be added. Although the total array of characters is quite within the limits of digital technology, many software developers have recently proposed reforms of various kinds to reduce the number of characters without adherence to the cursive nature of the script. The motive in these reforms is to make the Arabic printed form easier, quicker and cheaper to produce, and this involves the creation of a new kind of Arabic letter design. The single flow of the variant character forms of the traditional calligraphy gives way to formalised shapes; curves became angled and flourishes disappear. The result has been a range of computerised Arabic typefaces renowned for their simplicity and versatility. Western typographers might find this reminiscent of what happened to Latin letter design in the 19th century, though the motivating force was different.

Today's technologies have drastically altered the ways in which type fonts are developed and applied. An understanding of this is necessarily relevant to the Arabic designer for the simple fact that the computerisation of the Arabic script is accomplished utilising these technologies. In the new computer age the proliferation of typefaces and type manipulations there is a new level of visual pollution threatening the Arabic culture. Out of thousands of typefaces, all that is needed are a few basic ones, and get rid of the rest. To a large extent, the question facing the modern designer of Arabic letterforms and typefaces who adopted the computer as a design tool is the same one which has been debated virtually since the invention of movable type in the 16th century. That is, how much should the forms of Arabic letters retain their calligraphic origins and how strong is the case for simplification.

The introduction of digital typesetting meant that Arabic typefaces had to be converted for the new usage. Through the help of Monotype and Linotype the transition was made fairly smoothly and a range of Arabic typefaces have been available. By 1978 Monotype had already digitised their Arabic typeface for their 'Lasercomp' typesetters. Linotype also began to work with laser technology. In the beginning all digitised Arabic typefaces for these and other digital systems were stored as bitmaps. To prepare the typefaces for laser systems it was necessary to digitise analog artwork with a scanner. A graphics screen (display terminal) was used for reproducing the bitmap information produced by the scanner. Improvements to the shape of the character by deleting or adding pixels were carried out using editing programs. During the 1980's systems vendors new to Arabic type, using digital technology, appeared. These included Compugraphic, AM Varsity and others (Ali, 1995). This did not, however, mean the introduction of good new Arabic typeface designs. Most new manufacturers licensed type from Monotype or Linotype or modified the well known typefaces without permission, a pattern which was to repeat itself in the early days of desktop publishing. This made the period a lean one in the history of Arabic text typeface design. Notable was the introduction of a large number of Arabic types by leading calligraphic designers such as Mourad Boutros and Esmat Chambour who designed their first typefaces for Esselte Letraset and the range was also licensed to some manufacturers of computerised sign making systems for sale in the Middle East.

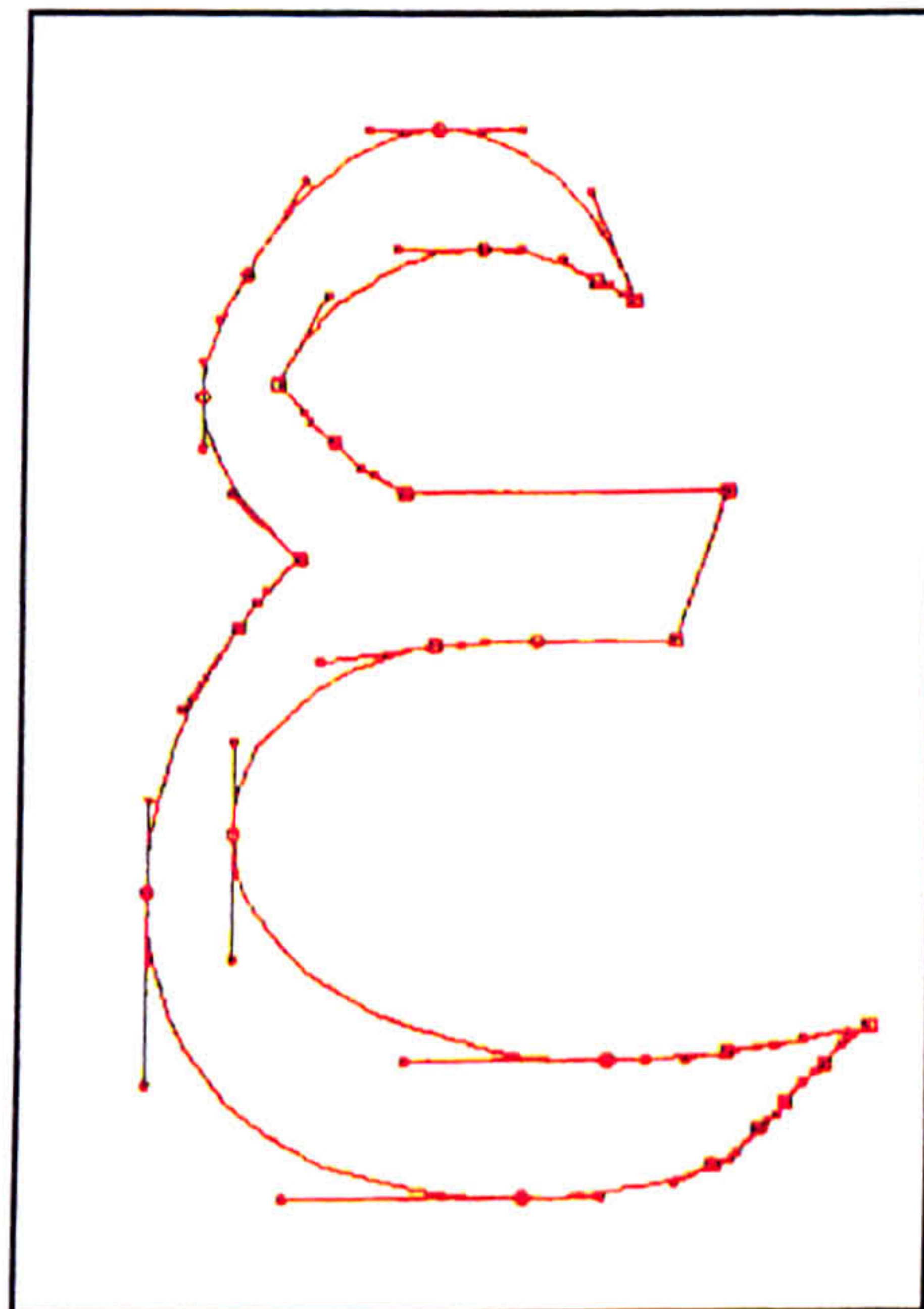
The London-based Diwan Science and Technology entered the Arabic computer prepress market in 1986 with a range of software for Arabic graphic design and font production. The company arabised Letraset's page layout program 'Ready-Set-Go' and called it 'Al Nashir Al

Maktabi' at first using typefaces modified from Linotype. The latest program, 'Design Studio', has now been Arabised by Diwan and is called 'Al Nashir Al Sahafi'. These programs are representative of the growing sophistication of computerised design and reproduction.

Typefaces are at the heart of graphics and it was Adobe PostScript's ability to handle typeface outlines which was important for the concept of desktop publishing. Although typeface quality varies, depending on the care and skill employed in original digitisation, Adobe original choice for the Bézier format allows accurate reproduction of character shapes (Figure 4.16)

Figure 4.16

Arabic Typeface Outlines Defined by Bézier Format



PostScript technology is based on mathematical descriptions of the outlines of the various letterforms. Rather than recording which pixel must be turned on or off as bitmaps do, the outline formulas, cubic Bézier curves, describe only the outline of the form and only activate those pixels which fall within these boundaries. This is a far more economical description of the form as it reduces redundant information by only recognising the outline and ignoring the internal pixel information. This is of enormous consequence because the computer, understanding the description mathematically, is able to numerically manipulate this information and thus allowing for such variations such as skewing, rotating, curving, etc. (Figure 4.17).

Figure 4.17
Arabic Digital Type Manipulation by the Author



In the Arabic world third party producers of typefaces are beginning to provide end-user fonts, just as has happened with Latin fonts, where type has become a commodity with thousands of typefaces available by mail order or as large libraries issued on compact disks. Arabic ranges such as the Diwan collection designed by Diwan Science & Information Technology widen the choice of designs available to Arabic DTP users (Figure 4.18).

Figure 4.18

Diwan Collection of Arabic Digital Typefaces

Source: International Typeface Corporation (1993). Applied Arabic Ltd., London, UK.

For Arabic types the sensitivity of the new outline formats increases the possibility of retaining all the elegance and quality of calligraphic influences in new typeface fonts. Alongside improvements in computer prepress software, including such aspects as contextual analysis and increased character sets, new fonts provide all the facilities necessary for quality Arabic type and layout.

Interestingly, the very latest technology to be applied to Arabic type, digitisation, which at first emphasised the problems of the calligraphy form, now begins to allow a return to the reproduction of the written word at its most artistic level.

Following the invention of movable type by Gutenberg in 1436 the subsequent development of Latin letterforms moved relatively rapidly away from the cursive, calligraphic forms of the European writing masters and evolved, through the well documented history of printing types, to the basic categories of type which we recognise today, roman and sans serif letterforms. The calligraphy origin can sometimes be glimpsed in the italic forms of seriffed letters, but true calligraphic styles remain very much a minority interest. The twentieth century has seen a revival of hand styles, even to the extent that ITC Zapf Chancery appears in the 'core' typeface set in most laser printers. Even this alphabet, designed by the leading post-war type designer and calligrapher — Hermann Zapf, is used mainly for special occasions and rarely in the day to day typographic communication of the newspaper and magazine. (Daines, 1993)

For the first time since the invention of moveable type modern technology provides the ability to set Arabic type exactly as the calligrapher would write a piece of text. It is sometimes difficult for the western observer to realise that, even today after considerable advances in Arabic typesetting, including those of computer prepress technology, the printed word in Arabic is subservient to Arabic calligraphy. The

interplay between the calligraphic forms and the development of printing types is more complex and closely meshed than in the western world.

As stated earlier, digital technologies have significantly changed the way the printing industry works. But adopting these new technologies, such as computer integrated prepress systems into businesses in developing countries makes people think about them in different ways. As a result, there have been numerous researchers examining the adoption and diffusion of innovations. The next chapter reviews this phenomenon in a contextual analysis as it relates to the introduction of digital prepress technology in the graphic arts industries in Kuwait.

Chapter 5

DIFFUSION OF INNOVATIONS AND THE ADOPTION PROCESS

In this part I review the literature concerning the diffusion of innovations and the adoption process, and determine that Rogers' (1983) model provides a suitable framework for evaluating the development of computer integrated prepress systems in Kuwait.

An extensive literature search did not reveal any previous work dealing with the adoption of computer integrated prepress systems by managers of commercial printing firms in Kuwait. Much of the literature pertaining to prepress technology emanates from the industry in the form of trade publications. It tends to be anecdotal in nature, consisting largely of self-reported incidents that have taken place at various printing firms which have adopted some of the technology. This is not entirely unexpected, given the evolutionary nature of technology. However, there does exist literature which addresses change, diffusion and adoption of innovations in general. These are the concepts which underlie this research. Scholars have contributed knowledge in this area, but it is only since the 1940's that the process of technological innovations and their diffusion started to develop. The work of Rogers (1983) and his colleagues on the adoption and diffusion of innovations provided the main insight, and guided the selection of the major variables under study. Rogers and Shoemaker (1971) conceptualised the processes of diffusion and adoption of innovations, and made generalisations on the principal variables which influence these processes. Their work was based on a series of studies from several research traditions in different cultures.

The Context

Technological innovations, population explosion, and increasing literacy have led to a rapid growth in mass media institutions throughout the Third World — defined as the less industrialised nations in Asia, Africa, and South America. Nowhere has this growth been more apparent or rapid than in the Arabian Gulf states — Kuwait, Saudi Arabia, Bahrain, Qatar, United Arab Emirates, and Oman — where the oil economies have spurred tremendous leaps in education, technology, and transportation. Technological development has been viewed as a function of economic growth, social and cultural change, political participation, and mass media development. This view assumes that a nation's development in one area depends on growth in many other areas.

There has been a tendency among researchers in the West to discuss the world's media systems in the very narrow context of their political uses and functions, oftentimes ignoring the cultural and social mechanisms at work in those same systems. Also these political studies tend to use freedom of the press as the ideal against which all other systems are measured. Edelstein (1982) elaborates on the pitfalls of such an approach:

The idea of system has influenced strongly comparative research on freedom of the press, but problems of measurement, identification of key variables, and the lack of social context has limited the emergence of theories.

It is suggested that a sensible way to understand media systems is to look at the basic assumptions which a nation holds about man and his relationship to the state and society as a whole. They view the older topologies as incapable of handling the more subtle and distinctive differences within a group of systems.

It is not always easy to fit a country into one of the theories and groups. For instance many countries are both communist and developing. Developing countries are sometimes divided into two subgroups: The Third World of needy countries and the Fourth World of the newly rich oil nations. Moreover, countries change and so do their media systems. (Edelstein, 1982)

While Edelstein (1982) find validity in the ideological classifications, i.e., government vs. private control, they would add two more dimensions to the classification of systems: 1) the degree to which technological innovations satisfy individual needs; and 2) the degree of technological sophistication and diffusion.

In their studies of modernisation in developing countries, researchers such as Lerner (1956), Pye (1963), Schramm (1964), Farace (1966), and Rogers (1978) agree that technological development is a vital tool in building a nation. Moreover, the United Nations Educational, Scientific, and Cultural Organisation (UNESCO), along with developing countries themselves, view technological development as a bridge toward stability and mobilisation in social change. Although this view offers some global explanations, recent research suggests that it is not easy to consider all developing countries alike, in fact recent studies have devoted more attention to differences than similarities among developing countries. Despite the validity of the criteria developed in early studies to explain the role of technology transfer in national development, the major differences and paradoxes in the Arabian Gulf states economic, social, and political spheres almost defy clear-cut analysis of those countries' national development.

Although the Arabian Gulf states have been given international attention in the last decade because of their oil industry, communication

research efforts of Western scholars and writers of this geographic area remain scarce. As a field of study, graphic communication is relatively new in the Gulf area. This study's focus is limited to Kuwait because of the level of its printing and publishing industries in comparison to other Gulf states. The Kuwaiti printing and publishing industries are reputed to be the most technically advanced in the Arab World and has the largest circulation of published magazines in the region (Majid & Jurdi, 1997).

Technology Transfer and National Development

The concept of technology and development has become an important field of research ever since attention was first focused on the emerging nations of Africa, Asia, and South America. The impetus for the research comes from recent 20th century phenomena, such as the decolonisation of Asia, Africa, and South America; the discovery on these continents of untapped natural and mineral resources; and the increased role these new nations play in world politics. The decades of the 1950s and 1960s gave rise to an impressive accumulation of studies devoted to the subject. As nations strive to modernise, the role of technology in national development has been envisioned as a vital means toward stability and prosperity.

However, researchers and media experts have approached the relationship of technology transfer to the development process from a variety of perspectives. One intellectual stream of research that addresses the problem of technological development in Third World countries is represented by Lerner (1956), Pye (1963), and Schramm (1964). In his landmark work, *The Passing of the Traditional Society*, Lerner (1956) incorporates into a model of modernisation the sociological variables (population size, urbanisation, gross national

product, per capita income, education level, and political participation) and correlates them with indicators of media level (number of printing presses, number of publications and newspaper circulation per capita) to establish their mutual interdependencies.

Lerner (1956) and colleagues have suggested that development is a chain of interactions among the sociological and economic variables and technological development; all have advanced forward together, stimulating each other. Their correlational studies have demonstrated that the interrelationships among technological development measures and other socio-economic variables are very strong and that technological development is both an index of development and an agent of change itself in a nation. Lerner's model is set in a sociological framework. It outlines the social preconditions (such as literacy and urbanisation) for the increased use of technology within a social system and establishes their mutual relationships. Lerner (1958) asserts:

The modernisation process begins with new public communication and the diffusion of new ideas and new information which stimulate people to want to behave in new ways.

Traditional methods of sending and receiving of messages have been considerably expanded by new technology. The introduction of computer technology capable of filling the literacy gap in developing countries, has probably changed Lerner's 40-year-old equation. Gradually, it has been realised that the technology in facilitating development is a far more complex process than that advocated earlier by Lerner. Schramm (1964) adds that contextual studies including geography, culture and social backgrounds, and political systems are critical in determining technology's functions. The rationale for function, he explains, is the result of whatever philosophy of man has

evolved in a given society:

Developing is a voluntary activity on the part of a society in which no exclusive group imposes its own set of values. The second ingredient of this process is innovation rather than imitation. It is ironic that, while the West itself has developed through innovation in science, technology and social organization, providing new responses to new challenges, it expects that the non-western world should only imitate or adopt western institutions and should not disturb the creative monopoly of the West. But imitation does not and cannot release the creative energy in the imitator. It only perpetuates his dependence on the model. Even if the non-western world could achieve some materials development by imitating the West, it could only solve its pecuniary problems and could not make a contribution to world culture.
(Schramm, 1964)

Schramm (1964) asserts that if the media are indeed essential national resources to be used wisely in the modernisation and development processes, it is natural for effective relationships to be established between technological development and the process of change, which implicitly includes the introduction of innovation. Such historical and contextual studies have given way to more controlled collaboration and empirically based research designs. Along with Third World countries and UNESCO, Schramm has focused on elements of social structure, individual participation and networking. The concept of “diffusion of innovations” has been adapted as a basic approach to development through orientation in rural areas. Sommerlad (1966) explains how this concept works in an agricultural setting. Before a farmer adopts a new agricultural practice, he passes through stages in his mental approach to the problem:

At the first, the awareness stage, the individual is exposed to the innovation, but lacks complete information about it. He seeks further information in the interest stage, and at the

evaluation stage applies the innovation mentally to his own situation and decide whether or not to try it. An experimental use of the new practice takes place at the trial stage, and finally, if the trial is successful, a decision is made for adoption. The mass media frequently bring the earliest information and constitute the awareness stage. At the interest stage, the mass media may be one of the sources to provide additional details, through the extension agent and other methods of interpersonal communications. During evaluation, mass media may also make an important contribution by stimulating discussion, and possibly group decisions. (Sommerlad, 1966)

Diffusion of Innovations and the Adoption Process

Perhaps one of the most important and intriguing problems for innovation researchers relates to the principal variables which influence the diffusion of innovations and the adoption process.

The diffusion of innovation theory is based on the elements and processes by which new ideas or practices are spread to members of a social system over time and either adopted or rejected by them. The four elements are innovation, communication, social system, and time. Rogers (1983) described the four elements as (a) the innovation, (b) which is communicated through certain channels, (c) in a social system, (d) over time.

With regard to 'innovation', "it is the newness of the idea in the message content of communication that gives 'diffusion' its special character. The newness means that some degree of uncertainty is involved" (Rogers, 1983). It appears that all innovations are not accepted at the same rate because acceptance varies with the characteristics of the innovation, the social system norms on innovativeness, the opinion leader's role in transmitting knowledge, and the role of the change agent in disseminating information.

The adoption of an innovation paradigm is a three-part model formed by (a) Antecedents, (b) Process, and (c) Consequences. Antecedents are those individual and social system characteristics which exist previously, and independently of the process itself, but which influence the individual's adoption-decision process. Rogers (1983) differentiates antecedent variables as socioeconomic, personality, and communication behaviour factors.

An individual's decision about an innovation is not an instantaneous act. The adoption-decision process occurs over time and consists of a series of sequential stages: (1) Knowledge: the individual is exposed to the innovation and gains some understanding of how it functions. (2) Persuasion: the individual forms a favourable or unfavourable attitude towards the innovation. (3) Decision: the individual engages in activities which lead to the choice to either adopt or reject the innovation. (4) Implementation: the individual puts an innovation to use. (5) Confirmation: the individual seeks reinforcement for an innovation-decision already made. At this stage he or she may reverse the decision if exposed to conflicting messages about the wisdom or profitability of continuing the innovation.

Consequences are the individual or social system changes that occur as a result of the adoption or rejection of the innovation. In addition to generating the diffusion-adoption model, Rogers (1983) drew generalisations about the major variables involved in the process (Figure 5.1).

Figure 5.1
Rogers' Model of Stages in the Adoption-Decision Process

Unit

lon

Source: Rogers, E. (1983). *Diffusion of Innovations*. New York: Free Press.

The Model

One of the principal constructs derived from the research tradition is the concept of innovativeness, or the degree to which an individual is earlier in adopting an innovation, in relation to other members of the social system. This concept is particularly important in Roger's model because it allowed him to categorise individuals according to their decision to adopt new ideas. He has characteristically categorised people into five adopter categories as follows: *Innovators* and *early adopters* are those who are predisposed to adopt while the innovation is still a 'new idea'; the *early majority* adopts new ideas just before the average member of a social system: they follow deliberate willingness in adopting, but seldom lead the process; the *late majority* adopts new ideas after the average member of a social system, and is more skeptical toward new ideas; *laggards* are the last to accept new ideas — by the time they adopt the innovation it may have been superseded by a more recent idea (Rogers, 1983).

Five Adopter Categories on a Basis of Innovativeness

1. *Innovators*: Venturesome

Innovators are eager to try new ideas and are the first to adopt a new innovation. They can cope with the high degree of uncertainty that exists concerning the new innovation at the time that they adopt it. Cosmopolites - their interests lead them out of their local peer group into a peer group of cosmopolitan origin.

2. *Early Adopters*: Respectable

The early adopter is generally sought by change agents to be a local missionary for speeding the diffusion process. Because early adopters are not too far ahead of the average individual in innovativeness, they serve as a role model for many other members of a social system.

- Localites: Early adopters are a more integrated part of the local social system than the innovators. They have the greatest degree of opinion leadership in most social systems. They are the people that others look to for confirmation of the acceptance of new ideas.
- Role: To decrease uncertainty about a new idea by adopting it, and then conveying a subjective evaluation of the innovation to near-peers by means of interpersonal networks.

3. *Early Majority*: Deliberate

The Early Majority's unique position between the very early and the relatively late to adopt makes them an important link in the diffusion process. They provide interconnectedness in the system's networks.

- Adopt new ideas just before the average member of a social system.
- Interact frequently with their peers, but seldom hold leadership positions.
- Deliberate for some time before completely adopting a new idea.

4. *Late Majority*

Members of the Late Majority approach innovation with a cautious approach. They do not adopt new innovations until most others in their social system have done so. Adoption of new innovations by this group may be both an economic necessity and the answer to increasing network pressures. Almost all of the uncertainty about a new idea must be removed before the late majority feel that it is safe to adopt.

- Adopt new ideas just after the average member of a social system.
- Can be persuaded of the utility of new ideas, but the pressure of peers is necessary to motivate adoption.

5. *Final Adopters*: Traditional

Final Adopters are last in a social system to adopt an innovation. When

final Adopters adopt an innovation, it may already have been superseded by another more recent idea that is already being used by the innovators. They base their point of reference in the past.

- Their traditional orientation slows the innovation-decision process.
- Base their decisions in terms of what has been done in previous generations
- Interact primarily with others who also have relatively traditional values.
- Are cautious of innovations and change agents.
- Must be relatively certain that a new idea will not fail before they can afford to adopt.

Attributes of the Innovation

An innovation contains five characteristics that help project its rate of adoption. These characteristics or attributes constitute the diffusion model. An innovation can be easily adopted if it has clear or specific advantages over the existing one, is compatible with existing values, is relatively easy to use on trial bases or small scale, is easily communicated to others, and, will be visible. Rogers (1983) describes those characteristics of innovations which affect the rate of adoption as *relative advantage, compatibility, complexity, trialability, and observability*.

1- Relative Advantage

Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes. e.g. economic profitability, decrease in discomfort, savings in time and effort, immediacy of reward

2- Compatibility

Compatibility is the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters.

3- Complexity

Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use.

4- Trialability

Trialability is the degree to which an innovation may be experimented with on a limited basis.

5- Observability

Observability is the degree to which the results of an innovation are visible to others.

Characteristics of the Adoption Process

In addition, other factors involved in the adoption rate of an innovation are:

Predispositions of the individuals

The predispositions of the individuals influence their behaviour toward communication messages and the effects that such messages are likely to have. Individuals generally tend to expose themselves to ideas that are in accordance with their interests, needs, or existing attitudes. We consciously or unconsciously avoid messages that are in conflict with our predispositions. This tendency is called selective exposure.

Innovators are usually identified by their cosmopolitanism, their influence within a social system, leadership in giving opinions, operation of large size organisations, effective communication skills, relative youth, higher level of education, higher income, more efficient management systems and employee-oriented attitudes.

Studies on innovation have shown that individuals show considerable variation in background factors on the basis of their innovativeness. Because these factors inhere in the individuals or in the social system, they are antecedent to the innovation-decision process itself. Rogers

(1983) also emphasises the importance of individuals' attitude formation in the continuance or interruption of the process.

Social System

The social system constitutes the boundaries within which an innovation diffused and is composed of individuals, groups, and/or organisations. All members of a social system (innovators, change-agents, opinion leaders, early to late adopters) are joined in the common objective of seeking and spreading information about the innovation. Varying relationships within the social system occur among its members that can affect the diffusion process. The system also holds change-agents and opinion leaders who directly influence the course of the diffusion.

Time

Diffusion studies measure (1) the timespan of first knowledge of an innovation through to acceptance or rejection and (2) the earliness or lateness of a system member's adoption compared with others in the social system. These ultimately determine the rate of adoption, from which can be calculated the total number of adopters and the times at which they adopt. Time is crucial to an innovation is diffused among this social system. The rapid communication rate speeds up the diffusion process and shrinks the amount of time necessary for sharing knowledge and for making a decision about the innovation. The innovation, then, has a small time frame within which to establish itself.

Communication Channels

Information sources play an important role in the adoption process. The individual usually gains knowledge of the innovation mainly through impersonal sources, such as the mass media. At the persuasion stage,

when the individual forms his or her perceptions of the innovation, local and personal information sources are more important.

A communication channel is the means by which messages get from one individual to another. The effectiveness of a communication channel decides the fate of an innovation's adoption. Mass media channels figure prominently in many diffusion processes because of their ability to carry information to a wide audience in a short amount of time. Another effective communication channel in the diffusion process is interpersonal communication. Information and advice from peers often carries more weight in an adoption decision than technical specifications or product documentation.

Findings of Previous Diffusion and Adoption Studies

Gold (1980), in a study of the complex decision process involved in the adoption of technological innovations in industry, indicated that there were external and internal factors often ignored when treated traditionally. The external and internal shortcomings demonstrated that diffusion rates were expected to change over time as a result of adjustments in the cost of adopting the innovation (discussed later) and in the availability of capital to the non-adopter. In addition, the proportion of adopters was expected to increase with evidence of decreasing technological risk and also with growing competitive pressure from earlier adopters. Technological innovation in industry appears to be updated with time, thereby affecting reliability, operating flexibility, efficiency and precision, all of which could affect productivity.

Jensen (1982) carried out research with two similar firms on adoption and diffusion of an innovation of uncertain profitability, based on the

effect of information and management attitude toward innovation. He indicated that when an innovation was introduced, a firm might not know if it was profitable to adopt or not. Waiting would reduce this uncertainty, and also enable the firm to gather more information, usually from the innovation's supplier or industry trade journals. "Firms may delay adoption of an innovation if they do not know whether it is good (profitable) or not in order to gather information and reduce this uncertainty".

Hannan and McDowell (1984) conducted a study on banking firms, in order to determine the relationship between market structure and the adoption of new technology, such as automatic teller machines (ATMs). The results indicated that a higher conditional probability of adopting the teller machines was found in larger banks and banks which operated in more concentrated local banking markets. Also, the bank's regulatory environment in which banking firms operate, shaped its decisions on whether to adopt a new technology. Moreover, labour-saving and wage savings, size, membership of a large holding organisation, the need to attract new customers or, as an alternative, to provide support and convenience where branching is restricted, and cosmopolitan or urban location are all positive and significant in the adoption of automatic teller machines among banking firms.

Farrel (1985) indicated in his study of standardisation, compatibility and innovation that firms and consumers benefit from standardised and compatible products. This preference for standardisation to a certain extent slows down the impetus for innovation. "The problem of coordinating innovation or a change of standard in an industry in which products not compatible with others put firms at a substantial disadvantage. Moreover, either inefficient inertia or inefficient

innovation can surface due to incomplete information on compatibility, and these problems may not be completely resolved by communication among firms”.

Adler (1986), in the study of new technologies and new skills, indicated that it is not an easy task for managers to ascertain the skill requirements of new technologies. Mistaken assessments, however, can be costly. “Management should be alert to the sacrifices such designs impose in terms of labor motivation as well as in long-run operations flexibility. Careful consideration should be given to the advantages of job-rotation and of programs which give employees real ‘think-time’ — which preserves and encourages their mastery of the process, as well as their involvement in its improvement”.

Lichtenberg’s (1987) study on the comparative advantage of employing educated workers, in implementing new technology indicated that “highly educated workers have a comparative advantage with respect to the adjustment to and implementation of new technologies...the relative demand for educated workers declines as the capital stock... [equipment and plant] ages. Thus, the education-distribution of employment depends more strongly on the age of equipment than on the age of plant”. In short, new equipment, by implementing innovative technology, requires a higher level of education among the workforce.

Wozniak (1984) conducted a study to determine the factors which influenced the decision to adopt an innovative livestock feed additive and the decision to adopt an interrelated or complementary technology of implanting growth hormones by looking at various factors involved. The first was the role of innovative ability, such as education, experience, availability of information, and the economic incentive to be

informed about innovations. The results indicated that the presence of such innovative ability, significantly affects the adoption of new technology. Secondly, he concluded that new technology is likely to be adopted if it is compatible with the existing one, rather than displacing it altogether. The adoption is also strongly related to concurrent innovations. As stated, “the diffusion of previously available innovations depends on the introduction and adoption of interrelated current innovations”. The researcher also indicated that the scale of production is possibly linked to the likelihood to adopt current innovations and use previously available ones.

Pennings and Buitendam (1987), conducted a study on the diffusion of microelectronic technology in organisations. Their discussion includes the following observations:

— A ‘cultural lag’ occurs between the rapidly developing technology and the social and psychological processes of individuals and groups which must deal with it. In the present study, that lag can involve aesthetic and design concerns in a publication’s visual appearance. The capabilities of the new technology may not be fully or appropriately exploited because of the user’s lack of acceptance and understanding, or because there is an inefficient apportioning of responsibilities among staff involved with the new equipment.

— The fact that organisations are human aggregates with all sorts of individual and organisational values, traditions, and procedures may mean there are impediments to the adoption of new technology.

— The decision to move into new technology has a political dimension, as those who are most affected by it on a daily basis may be too low-level in an organisation to be included in the decision-making process.

— The adoption of new technology does not necessarily mean resistance has been overcome. Instead it may only mean that old organisational and individual routines are being followed, albeit in a changed technological environment. That is, the new technology is being adapted to the old ways of doing things, rather than completely reshaping them .

Criticism of Innovation Research

Researchers refer to implementation of innovations over time as diffusion. Diffusion is assumed to occur in two steps. During the first steps early adopters think through the benefits of the proposed innovation and select to try it. In the later stages, others see early adopters using the new innovation and decide to try it. Tyre & Orlikowski (1993) believe that adoption of innovations is a matter of degree. Some customers believe in some innovations much more strongly than others. Some make it part of their lives while others pay only little attention to it. They believe that the implementation of an innovation may fail for several reasons including:

- Innovation failure – The proposed innovation fails to meet customer needs.
- Communication failure – Customers are not aware of the innovation, how to use it and what to expect from it.
- Adoption failure – Because of resources or differences in perceptions and values, customers are deciding not to adopt the new innovation.
- Implementation failure – The organisation fails to implement the innovation despite choosing to adopt it. Usually, because the adoption decision was made by people who are not affected by the

implementation.

– Maintenance failure – The organisation fails to keep up with changes needed to maintain the new innovation.

The concept that adoption of innovations should be examined over time and that customers differ in their rate of adoption is so basic that needs not be tested. Nevertheless, this concept was tested in several studies. Despite the common sense behind this concept and the data supporting it, it is missing from many other theories of managing change, including Total Quality Management. Innovation diffusion started from research on adoption of agricultural techniques. It quickly spread to other fields including management. At the core of this research are factors that promote adoption.

Conceptual Framework

Although it is not contemplated that any new theories about the adoption and diffusion of innovations will be developed in this study, a review of Rogers' model is essential for studying the process of technological innovations and their diffusion in developing countries. Vital to this particular study, Rogers attributes the immense popularity of diffusion studies, in general, to the ways in which they provide an understanding of social change. Rogers' diffusion model provides a way to document and make clear those implications. This study will borrow the numerous elements outlined in the model in order to construct the survey questionnaires and carry out the field work.

The Extent to which Rogers' Model is Used in this Study

Diffusion theory is a research approach which measures how an innovation is adopted among a population. After an innovation is introduced, it is adopted by a somewhat eccentric and/or entrepreneurial group called the innovators. This group, being slightly

outside of the norm, does not possess the weight necessary to drive adoption. Change-agents or opinion leaders among the social system will step in next, thereby legitimising the innovation and opening the potential for adoption to all members of the system, children's games call this 'Follow the Leader'. The next stage in an innovation's adoption is characterised by widespread adoption until such point that the innovation has saturated the social system and growth tapers off.

The main purpose of this research is to study the adoption and impact of digital prepress technology in Kuwait. The specific objectives are:

- (1) To investigate the extent to which managers of commercial printing firms in Kuwait have adopted computer integrated prepress systems.
- (2) To identify the factors which influence the adoption of computer integrated prepress systems by managers of commercial printing firms in Kuwait.
- (3) To find out how the new technology is affecting the people involved in the process.
- (4) To see if there is a detectable change in the page layout and design of Kuwaiti magazines as a result of the new technology.

Therefore, if the predispositions of managers of printing firms in Kuwait influence the adoption of computer integrated prepress systems and contribute to their eventual implementation, the following model's characteristics and attributes may contribute at all stages and will influence the responses of managers and designers. The adoption and diffusion of digital prepress technology in Kuwait may be measured against the following classification scheme by informing the methodology of the study in the next chapter:

Classification Scheme

Components of the Model

1. Innovation
2. Communication
3. Social System
4. Time

Sequential Stages of the Adoption

1. Knowledge
2. Persuasion
3. Decision
4. Implementation
5. Confirmation

Perceived Characteristics of the Innovation

1. Relative advantage
2. Compatibility
3. Complexity
4. Trialability
5. Observability

Predispositions of the Individuals

1. Previous practice
2. Felt Need
3. Innovativeness
4. Norms of the Social System

Chapter 6

RESEARCH METHOD AND PROCEDURE

This chapter describes the data collection method and the techniques which were used to select, process, and analyse data to achieve the objectives of this study. Research methodology, however, does not stand alone. It is based on and relates to the thesis of the topic in which lie the convictions and orientation of the researcher.

At the outset of any scientific inquiry, decisions about what data to collect will depend on the purpose they are to serve; having sought to define a problem, we seek to determine the kind of data which could shed further light on it and test the initial hypothesis about it. It is however not the data alone, the "raw facts", which can do this, but their organisation and analysis according to a declared conceptual framework.
(Robinson, 1996)

Robinson (1996) states that the unavoidably uncertain nature of research requires rather that the direction and boundaries of the road to be travelled be determined as far as possible in advance; these limits, which may be restated as 'what data to collect?' and 'how to collect it?', will be determined by two conceptual or theoretical parameters: (1) the definition of the construct (problem), and (2) the design (appropriateness, validity) of the instruments.

For the purpose of this study, the construct is defined as a thesis whose various parts will be the object of testing and elucidation in the data collection process. This study's thesis might be formulated as follows:

The prepress production area of Arabic publications has its own social structure, along with a set of values, procedures and traditions, some

relating to Arabic language and design. These social and cultural factors do not easily change; instead, when a new technology such as computer prepress is introduced, it is shaped by the existing structure. Therefore while the technology itself may be revolutionary in the West, its effect for the moment in Kuwait has been mitigated by the environment. The existing social structure and culture are broad enough to absorb it and shape it, rather than being shaped and absorbed themselves.

Research Questions

The objectives of this study are to determine the extent to which managers of commercial printing firms in Kuwait are adopting computer prepress systems; to identify the factors which influence their decision to adopt; to examine how the new technology is affecting Arabic designers/art directors and the people involved in the process; and whether this has caused a detectable change in the visual appearance of Arabic publications.

It has been argued above, the choice of method reflects the researcher's assumptions. It thus provides an implicit or explicit guide to the formulation of the research questions and the ways in which these are best explored.

The previous four chapters discuss the literature review for the study. Chapters 2 and 3 provide a review of literature on computer technology in the graphic arts industries. The information available is discussed in order to provide background knowledge and understanding about computer based technology's impact and users' attitudes toward its roles in the design and production of magazines from which to approach the following research question:

How is the new technology affecting the people involved in the process — their jobs, their responsibilities?

In order to understand the role which computer technology plays in the digitisation of Arabic script, chapter 4 provides a background to the development of Arabic script and typesetting. The information provided serves as background information in dealing with the following research question:

Is there a detectable change in the visual appearance (defined here as design and layout) of Arabic publications as a result of the new technology?

Chapter 5 reviews the basic concept underlying the theory of the diffusion of innovations and the adoption process. The information covers the nature and characteristics of the innovation, peoples' behaviour and attitudes towards innovation, and agents of change or communication channels used to reach the adopter. The innovation diffusion approach provided the constructs from which to approach the following research question:

What factors influence the adoption of computer integrated prepress systems by managers of commercial printing firms in Kuwait?

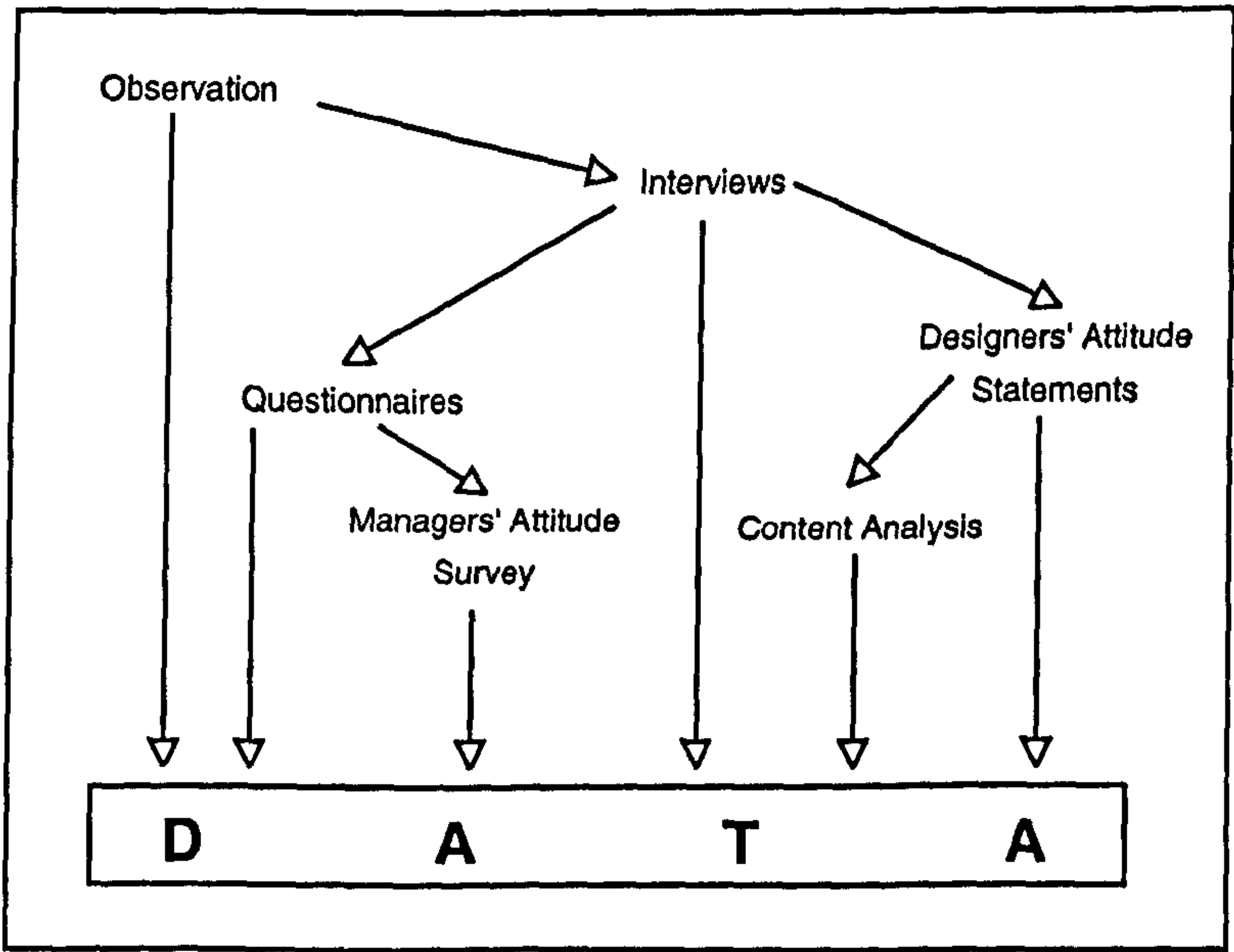
Methodology Selection

One of the features of the design of this research is the number of different methods adopted. Both qualitative and quantitative data were sought. The process followed was based on an emergent design in which each step built upon the previous experience as important areas for inquiry crystallised over time. This dynamic, open approach reflects Cave's (1982) suggestion, that:

...the research process does not take place in linear, but rather dialectical progressions, where one moves from the specific micro context to the macro context and back once again to anchor one's social statements in the personal landscape of the subjects in the field.

Based on these considerations, the methodological approach selected for this research can be defined as a dialectical, interpretive exploration. Though located within a conceptual framework which broadly defines the analytical dimensions, the emphasis is on generating concepts and working hypotheses from the data. As this research explores the nature and dynamics of a complex problem, it adopts the notion suggested by Robinson (1996), that scientific inquiry should be a continual process which does not separate static facts from the real world to test a-priori assumptions. Thus, use will be made of some of the analytical tools developed by Robinson (1996) and others in the field. These characteristics of the research design are summarised in the diagram below (Figure 6.1).

Figure 6.1
Data Collection Methods: Input from One Instrument To Another



Of the many viewpoints to be considered, the one guiding the researcher's initial approach thus needs to be made explicit. This has been done in terms of my general guiding assumptions and conceptual framework. At the more specific level of the content area of this research, the guiding theoretical premises are: (1) that technological change is a socially constructed phenomenon rather than a 'natural' technical-factual development with a set of inevitable social effects; (2) that the characteristics of technological change and its outcomes are the product of complex interactions between different societal groups and collectives which are shaped by and in turn shape certain perceptions, actions, and work environments; and, (3) that human activity cannot be equated with work as 'making a living', but that it must be explored as to its existential meaning.

This approach implies a dynamic moving back and forth between different levels of analysis (e.g. prepress workers, designers, printing managers, educators) and different kinds of data (e.g. interviews, observations, content analysis) in order to link historical developments, perceptions and interpretations of reality with action strategies and interactions flowing from and shaping the "objectively" emerging prepress environment. In as much as the human experience of work and its changes embedded in the historical, social, and cultural context is at the centre of concern, the starting point is the individual and subjective meaning attributed to the changing work-world. This experience as Samuel (1982) suggests, reflects the dialectical aspects of the broader context of social production:

The labour process itself is something which with the aid of oral evidence can be reconstituted with great precision... People's memory of their work, like that of childhood, is often peculiarly vivid, and extends to incidents, events and stories which give precious insights into the workplace as a

total context and cultural setting ... the nature of the learning process, the subdivision of the different classes of work the shifting balance of power between employer and employed.

This research, therefore, suggests the importance of contextual developments and structures, along with the exploration of perceptions and reflections. Riegel (1976) proposed:

It is insufficient and distorting to study individuals unless they are studied in their developmental progression... Only a conception in which individuals are seen in their developmental contest, and in which developmental changes are seen in their changing cultural-historical context can lead to a comprehensive understanding of human activities.

The Questionnaires

The Managers' Survey Questionnaire

The participants in the survey were senior managers working in commercial printing firms in Kuwait. The sample was drawn from a comprehensive official industry list provided by the Kuwaiti Chamber of Commerce and Industry in May 1993. The population size was 183 managers covering the total number of commercial printing firms in that list. This official list helped to clarify any queries regarding the existence and the speciality of the firm.

Oppenheim (1992) discusses questionnaire construction. He regards it to be a self-administered survey technique used to collect information directly from subjects at a minimum of time and expense. The questionnaire used in this survey (Appendix A) was primarily a subject information questionnaire which was designed to gather the information necessary to determine the extent of adoption of computer prepress systems by managers of commercial printing firms in Kuwait. The questionnaire was constructed on the basis of information gathered

from the literature review and from the managers of the printing firms. Factors examined were profitability, productivity, quality, equipment compatibility, labour cost, new markets, size of firm, and the personal and professional characteristics of these managers. Respondents were asked if they were using computer prepress systems, and the reasons for adopting them, in order to determine the extent to which the managers had adopted the technological innovation. Other questions were included which asked how the respondents first heard about the technological innovation, whether they recommended that the equipment be purchased, the number of employees in the firm which is indicative of the size of the firm, and whether the firm had a research and development facility. Respondents were also expected to indicate any mechanical experience in prepress, courses taken, sources of information on innovation, job title, and age. Managers were also asked about their expectations of computer prepress systems in their firms, and whether or not those expectations had been realised; the saving in production time by switching to computer prepress technology; the changes in staff structure and responsibilities resulting from computer prepress systems. All of the above information was used to address the research questions described earlier, to determine their relationship with the adoption of the technology by these managers. The basic data obtained from this questionnaire provided a guide to both the firms' overall work conditions, and to their specific experiences involving computer-based prepress technology.

Of the 183 questionnaires which were sent to the printing managers, a total of 148 usable questionnaires were received, representing a response rate of 80 percent in the first national survey on the subject in Kuwait.

The Designers'/Art Directors' Survey Questionnaire

The more comprehensive questionnaire (Appendix B) was designed to gather general information about computer prepress usage in a variety of Arabic magazines. This information provided a broad contextual background of the experience in a number of magazines, leading on to the more detailed examination of three specific magazines. Designers and/or art directors were asked about the involvement of computer prepress in the production of their magazines. Questions concerned the processes which computers were used for; how long computers had been utilised in their operations; their use of hardware and software; their expectations for computer prepress in their magazines, and whether or not those expectations had been realised; the saving in production time by switching to computerised design; the changes in staff structure and responsibilities resulting from computer prepress; and the impact of the new technology on the process of production and on the design of their publications.

Questionnaires were sent to 112 magazines, and a total of 79 questionnaires were returned, with a response rate of 70.5 percent. Many respondents also added comments to the questionnaires to give more information. Some respondents appended letters to their returned questionnaires and offered further help if needed. Although respondents had the option of remaining anonymous, almost half did mention the names of their publications.

Confidentiality

As the use of written consent forms is not a widely known practice in research in Kuwait, I felt that it would be more alienating than reassuring to my informants. Furthermore, as a large number of my interviews took place in the field, in a very informal way, the idea of

asking my informants to read and sign a consent form first seemed awkward and inappropriate. I thus introduced myself as a graduate student working on a PhD thesis about how new technologies had changed the workplace. Keeping this introduction very general, I then told my informants, that I was interested in their own personal experiences and views around this question, and that there were no right or wrong answers. I emphasised that whatever they would tell me would be treated confidentially, meaning that where I might use their words they would be presented in a way that would make it impossible to identify them as individuals. In those instances where a tape recorder was used, I asked the person for permission, and explained the purpose of it.

Interviews with managers and designers/art directors were preceded by a phone call during which I briefly presented my research interest, the reason why I wanted to talk to them specifically and to ask for an interview. If they agreed to talk with me, which they did without exception, I sent them a three-page abstract of my research proposal and a one-page summary of the general questions that I wanted to discuss with them specifically. At the beginning of the interview, I again stressed the confidentiality issue, and suggested that they point out any comments they might want to make that should be considered 'off the record'. While, in general, the majority of these informants placed no restrictions on being linked with interview material, in two or three instances information was described as 'off the record'. Where this happened, I either did not use the information, or if it seemed very important, asked the informant if I might use it in a general sense which would make it impossible that it might be traced back to him or her personally.

Statistical Analysis

In social research a statistical approach is well established as a basic tool (Patton, 1987). The main aim of this study is to investigate the adoption and impact of computer integrated prepress systems in the printing and publishing industries in Kuwait. A statistical approach becomes more problematic when a given language is examined, since the question of what to count becomes rather complex and involves interpretation before any numbers are generated. Analysis of the use of technology in its social context has commonly used anthropological techniques of observation, interview and questionnaire. This study seeks to establish links between Arabic language and printing technology and so must deal with the qualitative and quantitative methods.

It is worth noting that many of the most interesting studies of the language/technology relationship are not quantitative, but focus qualitatively on the social meaning (Patton, 1987). It is precisely this 'social meaning', in the domain of technological development in the prepress area in Kuwait, that this research will seek to elucidate.

It was stated in the previous chapter that the diffusion of innovation theory is based on the elements and processes by which new ideas or practices are spread to members of a social system over time and either adopted or rejected by them. The four elements are innovation, communication, social system, and time. Statistical analysis is employed in order to establish relationships and linkages between these four elements and to ascertain how far certain patterns of response on the part of managers of commercial printing firms and Arabic designers in Kuwait may be typical of the population.

Relationships between such variables (profitability, productivity,

quality, equipment compatibility, labour cost, new markets, size of firm, and the personal and professional characteristics of managers) have been investigated in order to discover significant patterns of computer prepress use in the development context. The chi-square test is the most useful statistical technique for such data. Milroy (1987) writes:

... the more common situation in the social sciences is where we seek to examine the inter-relationship between two or more categorisations.... In these cases, we may need to determine not simply whether a statistical relationship holds between attributes, but also what the strength of that relationship is.... Many problems concerning relationships between attributes can be dealt with by the chi-square test.

Multivariate analyses (frequencies and percentages) were used to describe and explain the extent to which managers of printing firms in Kuwait have adopted computer prepress systems between 1989 and 1994. Chi square analyses of contingency tables and 'goodness of fit' tests were employed to determine the factors which influenced the adoption of the technology, and also any relationships which exist among the variables. The researcher analysed the data for the study by using SPSS (Statistical Package for Social Science) software. The calculated chi square tests were based at the 0.05 level of significance or probability. The formula used is:

$$\text{Chi square} = \sum [(f_o - f_e)^2 / f_e]$$

Where f_o = observed frequency

f_e = expected frequency

Qualitative Approach

In-depth Interviews

This study employed a qualitative approach based on a case study. Such an approach lends itself well to a detailed study of a few individuals (Fraenkel and Wallen, 1993). Several graphic design professionals were selected for this study, each of whom brought their vast and noteworthy experiences in to bear on my questions. The case study approach helps in discovering individual differences and experiences. According to Patton (1990) in-depth information from a small number of people can be very valuable, especially if cases are information rich. Such methods have also been used by Freedman and Rylan (1992) as they explored the use of computers in the art education classroom, and by Lorenz (1992) in his investigation of the extensive use of product designers by five major corporations.

In-depth interviews were conducted with designers and art directors of Arabic magazines. The purpose of the interviews was to examine, in greater detail the situation in 12 selected Arabic magazines in Kuwait. The interviews were designed to gather information on their computer systems, and their views on the use of computers as a design tool in the creation of magazine layouts; the length of time which computer prepress system had been in place; the functions it was used for; the kinds of hardware and software used; why the computer system was adopted; whether or not expectations had been realised, and the time-saving which had occurred. In addition, the role of the art directors in hardware and software purchases; specific changes in staff responsibilities since the installation of computers; their perceptions about the impact of the computer on design and the design process; and the impact of computerised design and production on content were also covered. All three directors were contacted by telephone prior to being

interviewed, in order to secure their interest and cooperation. They all were extremely interested in the study, very cooperative and generous with their time.

Patton (1990) states that the basic thrust of qualitative interviewing is to minimise the imposition of predetermined responses when gathering data. I achieved this goal by taking an open-ended approach. Patton (1990) describes open-ended interviews as the data from interviews consisting of direct quotations from people about their experiences, opinions, feelings, and knowledge. This was my primary vehicle for gathering new data for this study. This raw data, combined with the literature submitted by participants, provided me with a rich source of quotations. The intent in using this method is simply to allow the case study participants to describe their own transitional experiences regarding access to digital prepress equipment and the implementation of these technologies into their businesses.

I pursued a small purposeful sampling, rather than the larger groups of probability sampling. I used this technique, because I believe that the selected individuals had the information needed: (a) to address the problems identified, (b) to answer the questions posed, and (c) to achieve the goals of the study.

Interviews along with more informal conversations were an important source of information. The guiding theoretical premises outlined in the literature review provided the basis from which initial interview guides for the three participants were developed. These guiding questions were not intended to preclude emerging issues of importance but were aimed at opening up the area of inquiry. The issues addressed were to be expanded and modified as new topics of relevance emerged in the

interviews. This approach was thus comparable to what Dexter (1970) defines as 'specialised interviewing'. In contrast to standardised interviews, the informant is given 'nonstandardised' treatment which, according to Dexter (1970) means:

- (1) stressing the informant's definition of the situation;
- (2) encouraging the informant to structure the account of the situation;
- (3) letting the informant introduce her/his notions of what he/she regards as relevant, instead of relying upon the investigator's notions of relevance.

I sent a set of questions to each of the participants, three weeks ahead of the first scheduled interview. This preview of questions was helpful in that it a) allowed all participants the opportunity to carefully consider how they might respond, b) assisted in keeping the interviews within the two hours time allotted, c) reduced the pre-interview anxiety of responding to unexpected questions, and finally, it d) probably increased the overall quality of the responses or data collected. The questions were placed in story-like sequence. This sequence contained four sections or types of questions:

1. Introduction to computers — here participants were asked about their initial introduction to computer-based tools, the environment in which the introduction took place, and the tools they used.
2. General technology and graphic design — these questions covered some basic issues concerning graphic design and technology.
3. Digital prepress specific questions — these dealt with issues of computer based design tools.
4. Recommendations/Speculation — these asked educators for any suggestions they had for practitioners, and vice versa. They also allowed for exploration of the driving forces behind computer-based design and art technologies.

Before starting the interview, I briefly introduced myself and the study. I explained that there were no right, wrong, nor definitive answers. Further, I explained that I sought a response to each question, based on each participant's individual experiences on the job; and that the responses should be constructed in their own words. Patton (1990) indicates that the ideal questions are those that permit respondents to respond in their own terms.

I found that two of the three participants had prepared notes and often referred to them in the course of the interview. While the other participant had no visible notes, his responses still seemed fluent and well thought out.

All of the interviews were tape recorded and then transcribed. As much as possible, I transcribed all the recorded interviews verbatim, seeking a full transcription of each interview. According to Patton (1990) full transcriptions are the most desirable to obtain.

Once I transcribed all the tapes, I made laser printouts, proofed the material, then made the necessary changes to the file. As a means of following up on the initial interview, each participant received a hard copy of his interview. This procedure gave the participants a chance to check their responses for accuracy; and to make changes in terms of miscommunicated information, the correct spelling of names and places, etc.

As post interview rules for proofing, the respondents were asked not to change sentence structure nor to aim to make their responses grammatically perfect, but to focus on accuracy of content. Any post interview alterations were screened for these post interview criteria,

and updates were made to the initial transcript files. Of the three participants, only one sent his copy back with changes, and the changes made by this participant were minimal. The resulting transcripts were coded and then analysed on a microcomputer, using a text database program.

The Participants

The art directors and designers were given three weeks to prepare answers to the questionnaires. Subsequently, a visit was made to each art director, and an extensive interview was conducted in his office. All interviews followed the same pattern. The interviews began with discussions about hardware and software and the magazine's computer prepress cost investment, followed by tours of the computer workstations in their offices. They were asked to elaborate on specific staff changes which had occurred as a consequence of adding computer prepress systems and to explain explicitly how their production process had changed. Most of the conversations were directed towards the design of Arabic pages and how the computer as a design tool had affected what they did. They were asked to speak extensively about their attitudes towards the computer as a design tool. By this point in the interview they were generally very communicative and frank about their views on computers and Arabic design. The interviews ended with a review of the magazine under discussion. Each art director volunteered to be available for further questioning if more information was needed.

This group of case study participants includes some of the trendsetters in the profession who are involved with private firms which are leaders in the area of graphic design and technology in Kuwait. Many of them are pioneers in the use of emerging technologies in the workplace. The

criteria used to select and identify the participants are listed below.

1. They must have received early education and training in graphic design with traditional tools and methods;
2. They must have made the transition to computer-based tools;
3. They must have successfully incorporated digital prepress in a design firm; and
4. They must currently be practicing digital design today within a viable design firm (as practitioners).

To analyse the collected interviews, I chose a cross-case analysis approach (Patton, 1990). I began by writing a case description of each person based on all of the data collected from them. The case study was also based on observations I made during the interview.

The intention of these descriptive studies is to introduce the reader to the participant on an individual basis. Additionally, by including quotations from the raw data, I aimed to illustrate a sense of the person's attitude or position on emerging technologies and their use of new media in their practice.

Translation of Interview Information

It is important to remember that all the quotes used in this thesis have undergone a double translation process. All interviews were conducted in colloquial Arabic, my own and my informants' mother tongue.

Colloquial Arabic is basically a spoken language only, translated into 'official' Arabic in any written document. The recording of field notes and interview transcripts, therefore, involved a first step of translating colloquial Arabic into written, 'official' Arabic. Though these two dialects are very close, and most Kuwaiti Arabic words differ from

official Arabic words only in that they are pronounced differently, Kuwaiti Arabic contains a variety of colloquial terms which have no exact official Arabic equivalent. A similar problem was faced in the next step of translating interview information from Arabic into English. Where it was impossible to literally translate expressions or sentences, I tried very carefully to find an English expression which most closely captured what appeared to be the meaning of a statement made.

Observations

I also made numerous observations of work practices in production units, both formally during interviewing and informally during the industrial visits. I was able to compare the results of the interviews with the observations at work, thereby increasing the ability to judge the validity of the data.

In order to understand the meaning and the context of my informants' experience, I wanted to get first-hand knowledge of their work setting. Over a period of several weeks, I spent 3-4 hours each time either in the morning, afternoon, or at night in the graphic design department of different magazines. My goal was to gather interview information, to observe the work process at different times of the day, to have my informants explain to me 'how things worked', and to observe people's activities and social interactions in different departments.

Observation, and particularly participant observation, is by definition an activity engaged in by the researcher which cannot be delegated. The reason for this is clear: the process of observation not only serves to collect data, but also to attune the researcher to local realities and patterns, thus enabling him increasingly to understand what he observes from an objective point of view. (Robinson, 1996)

Robinson (1996) believes that the only way to gain direct access to

ethnographic and anthropological data, rather than relying on reports from others, — in other words to minimise the effect on description of the gap between what people say they do and what they actually do — is by observation. This criterion leads Ellen (1984) to give observation pride of place: “Whatever other research techniques the researcher might employ during fieldwork, the main data yielding procedure is observation.” Ellen (1984) and Milroy (1987) characterise observation as a ‘relatively unsystematised scanning of data’ and concur in its importance in fieldwork. They see the procedure as basic to the use of other procedures, observation providing the clues which other techniques — interview, questionnaire — will take up in more detail. They also point out that, in the pursuit of anthropological inquiry, observation cannot suffice in itself, but must be informed and structured by the observer's theoretical framework and complemented by procedures which take the inquiry beyond the particular phenomenon which has been observed.

Content Analysis

The decision to use content analysis in this study was based upon a number of criteria. Carney (1972) states that one of the best times to use content analysis is when source materials are voluminous and complicated, and when they contain all sorts of different kinds of subject matters. Unlike a questionnaire or participant observation, content analysis looks at the finished product and does not participate in the manufacture of the materials under investigation (Rapoport, 1969). Carney (1972) defines content analysis as:

...a general purpose analytical infrastructure, elaborated for a wide range of uses. It is intended for anyone who wishes to put questions to communications (pictorial and musical, as well as oral and written) to get data that will enable him or her to reach certain conclusions. Some content analyses are

more objective than others. All are more objective than impressionistic assessment of the same questions and materials. None is perfectly objective, though some approach this goal remarkably close.

Content analysis was chosen because, while it allows flexibility and a marked degree of reliance on intuition, it also supplies a focused and consistent approach. Deese (1969) suggests that content analysis is essentially a practical enterprise. It is simply a collection of techniques for providing interpretations of texts and similar products. Gerbner (1969) adds that the activity itself (of content analysis) is relevant to all those concerned with symbolic output in art, music, literature, history, psychiatry, psychology, sociology, anthropology, and the mass media because there has recently arisen a need to penetrate the veneer of technological and social change. In this investigation content analysis is used to describe how digital prepress technology is affecting the page design and layout of magazines in Kuwait.

Computerised design has taken on negative connotations among professional designers, perhaps, chiefly because of its use by amateurs in design and typography. Therefore, part of the examination of the magazines involved observations of their design appeal. The design analysis was the fourth part of the methodology. Its purpose was to determine whether or not Arabic magazines can be identified as being produced through computer prepress systems by a simple examination of their page layout and design. This required the development of an Arabic design analysis instrument which will be discussed in detail in the following chapter.

Chapter 7

THE DEVELOPMENT OF THE ARABIC DESIGN ANALYSIS INSTRUMENT

This chapter discusses the development of the Arabic design analysis instrument. As no prototypes of Arabic design analysis instruments which suited the needs of this study could be located, one was devised specifically for use in this study. Although research on typographic communication can provide the theoretical approaches to magazine design in which emphasis is focused on the choice and arrangement of the graphic elements, there is no research on the problems of the selection, arrangement and placement of Arabic language characters. The current graphic design practices for Arabic magazines are primarily based upon conventions or suggestions contained in literature which are all predicated on the characteristics of the Latin alphabet and the way in which they are written and read. It is the purpose of this instrument to determine whether the Western rules and conventions governing typographic functions can be utilised to serve Arabic design. In addition, the instrument will be used to determine whether or not Arabic magazines can be identified as being produced through computer based design systems by a simple examination of their page layout and design. First, the chapter reviews the foundations of design as they have always been understood. The impact of the computer on design is addressed in this context. Then, it explains the the validity and reliability of the Instrument.

Extensive review of graphic design literature made possible a summary of design fundamentals, in a communication sense, that graphic designers attempt to fulfil in making decisions about page layout.

Recognising the enormous importance of form and function, dominantly expressed in typographic terms, a review is presented of the attributes of Latin typography currently selected by Western graphic designers to serve these functions. The similarities and contrasts between the Latin alphabet and the system for writing and reading it with that of the Arabic alphabet is incorporated to provide a logical basis for analysis and description. The main source of graphic design recommendations relevant to this domain proved to be the conventions of magazine design. The information which follows is based on accounts given by designers and researchers into magazine design and typography. Influences on the graphic designer's choices and the characteristics associated with the physical properties, e.g. symmetry and asymmetry, organisation, structure and legibility attributes of a graphic layout in this domain are examined. The views of some graphic designers and researchers are referred to in support of particular rules to highlight their agreement or disagreement. The results of these studies as well as long term conventional use of graphic layout in publications have shaped the general rules of Latin alphabetical use in the Western world. While an attempt to synthesise these rules for the use of graphic characteristics, it is safe to say that this attempt will not represent a finalised set of guidance rules. The 'Western Model' is to be utilised in this study as a comparative base for the development of the Arabic design instrument to achieve the same graphic layout objectives.

Rules Versus Principles Versus Values

Normally, no great terminological problem should be expected in connection with the term 'rule'. A rule may change from one generation to the next, but the meaning of the term, it would seem, should be relatively stable. Poore (1930), in an early source, describes the rules of

art as the established methods or techniques by which the design objective is achieved. For example, in one period symmetry of design was the rule, and the design objective in this case was balance. In a later period, asymmetry became the rule among artists, but the objective remained the same — namely, balance. Thus rules are not necessarily either wrong or right, but they are necessarily tentative. Moreover, older rules are not necessarily discredited and not necessarily changed; they are simply displaced in use by other rules, perhaps only temporarily. And most importantly the idea of value has been introduced, in a straightforward and direct manner, and in a manner which combines functional with aesthetic values: The idea of value in art, and the idea that utilitarian values accompany aesthetic values in art has been debated by many researchers. The search for values, both utilitarian and aesthetic, is central to the concept of art itself which is beyond the scope of this study.

Computer Rule-Based Design Systems

Rule based systems are programs which allow some human knowledge to be made explicit as facts and rules. It has been argued that we can only replicate things in an expert system which can be understood objectively. Mechanical steps and the systematic processes used in some mathematic computations and engineering procedures, for example, can be replicated in computer systems, and our reasoning processes can be replicated in this way (Lansdown, 1982). The availability of computer systems able to analyse, compose, decompose and generate new visual representations according to the rules of a predefined prescription underline the computer's potential for the aesthetic evaluation of a graphic layout. Therefore it is postulated that a graphic design layout produced by a designer using a computer system could be systematically examined by similar rule-based techniques. In this

way a computer system could assist the designer with complex computations and in routinely ensuring that a design specification is adhered to. These rules may not guarantee 'good' design but may assist the novice to produce designs which are 'not bad' (Honeywill & Lockhart, 1997).

Design Fundamentals

Design fundamentals describe objective attributes of works of art and design like size, proportion, and colour; they also describe how those attributes affect an observer. They are the foundation concepts used by artists and designers to construct and create. They make possible the analysis and criticism of works of art or design. They facilitate communication between teacher and student, critic and public. They are the underpinnings of visual thinking. No attempt is made here to develop a complete history of the concepts in the other arts from which these new 'applied design' principles were derived, but it is important to establish that they are not typographic principles strictly; that they are the general principles of all design, translated into typographic terms and adapted to typographic needs, processes, and materials. The concepts of design fundamentals can be organised in any number of ways, and the specific terms applied to these principles vary somewhat from source to source. Design fundamentals are independent ideas only for purposes of study. Every work of art or design has a full range of visual attributes. No work of art or design consists of only one idea. The emphasis of one idea over others — colour over form, or symmetry over movement, for example — gives each work its individual character. The emphasis of one idea over another is also where different aesthetic theories, which are judgments about what is beautiful or 'correct' in art, diverge.

Design fundamentals are constant for two-dimensional images and three-dimensional objects, for static or moving images, for every medium, and for the art and design of every culture. Form, for example, is an objective quality. The words star, triangle, rectangle, circle, and square describe the physical fact of forms. Something is described as triangular or round as a matter of fact, not opinion. Forms can be assigned symbolic meaning, but in and of themselves they are objective figures and universally recognisable. (Holtzschue, 1997)

Typographic Principles

The design process has, as its objective, the creation of a graphic device through which readers can receive a message. In this process the selection, organisation and arrangement of letters, are the most critical in successfully attaining this objective. These semiological decisions involve the physical attributes, i.e., shape, size, structure, tone and colour of symbols in a purposeful complex. In grammar, syntax is the manner in which words are combined to form phrases, clauses, or sentences. Typographic syntax is defined as the process of arranging elements into a cohesive whole (Carter, Day, & Meggs, 1993). The study of typographic syntax begins with its basic unit, the letter, and progresses to word, line, column, and margin. Here, it is the typographic component of this complex which is of primary concern, but its relation to the other symbol components is measured and analysed as well. In publication design, these variables are discussed with emphasis on the combination of type style, size, and their positioning in a layout.

Type Styles

There are hundreds of type styles available, each of which differs in visual appearance, point size, weight, number of derivatives characters, and so on. The first requirement is to place these styles in some logical scheme of classification. Latin types have grouped themselves into two

distinct classes, according to their characteristics: Serif and Sans Serif. Variations in each class are numerous, but the basic classes have been fairly well identified.

As mentioned in chapter four the development of Arabic script resulted in historical classifications of a variety of type styles, each of which is known by the name of the person who invented it or by the name of the city where the invention took place (see Figure 4.5). In the new computer age the proliferation of typefaces and type manipulations has resulted in a new level of visual pollution threatening the Arabic culture. This phenomenon of digital typographic design has been echoed in the West. Negroponte (1995), a leading expert in digital media, noted that:

...too much freedom has also had ill effects on our hard-copy output from laser printer. The ability to change font style and size is a temptation that pollutes many present-day documents, which insensitively mix serif and sans serif type of all kinds and sizes: normal, bold, and italic, with and without shadows. It takes some deeper understanding of typography to realize that sticking with a single typeface is usually more appropriate, and to change size very sparingly. Less is more.

Arabic type designers produced hundreds of type styles primarily used for decorative purposes. Some of these styles are easier to read and an even smaller number are good for printing purposes. Style in typography is an act of interpretation. Typographic style does not mean any particular style, but the power to move through the whole domain of past and current typography with grace and vitality, responding to new conditions with innovative solutions. Recently, new demands for quality Arabic type styles has encouraged European agencies to produce a significant number of new styles (Figure 7.1).

Figure 7.1
A Contemporary Arabic Font From The Linotype Arabic Collection



Type Size

Size is one of the most important parameters (characteristics) of typography. While size is sometimes used to create nominal differentiation of elements, its greatest potential and most frequent use is to achieve some sort of hierarchical ordering within information categories. It is also important to indicate that the size and/or scale of the grid, the available space, the overall design, and the intellectual thrust of the designer are also major controls in the application of type size.

The characteristics of Arabic typography have not undergone evaluation in terms of the readability, legibility, or perceptibility and therefore little is known regarding how choices for typographic purposes can be made. As stated earlier, the computerisation of Arabic has allowed Arabic character size to be determined by the basic height of the letter as in the case of the Latin alphabet, but how this variation affects user/reader reactions is essentially unknown and beyond the scope of this study. The comparison between the two size systems is shown in Figure 7.2.

While Arabic type style and size variation are somewhat different from those of Latin, their application in typography is analogous. The other typographic characteristics (see Table 7.3) are divided into two categories. The first contains varied characteristics which parallel those of Roman, such as body weight, character extension, condensation, slant, and spacing between words. Their selection and arrangement to achieve different functional purposes is similar to Latin.

The second group contains the other characteristics of Arabic typography which differ from their counterpart in Latin. The distinction

between upper and lower case, as well as spacing between letters, does not exist in the Arabic case and thus, the functional potential that these elements present in typography with the Latin alphabet have no equivalent in Arabic. The character sequence and relation in the Arabic language is the opposite of that of the Latin alphabet used in many languages. Due to these differences, the general arrangement and the placement of Arabic typographic elements related to magazine design have to differ from the Western conventions. It is also safe to say that the general principles for utilisation of the Latin alphabet are generally suitable when the designer is planning for use of the Arabic alphabet.

Figure 7.2
Comparison of the Roman and Arabic Alphabet Point Size

5 pt. size	جمال الخط العربي The Beauty of Arabic Calligraphy
7 pt. size	جمال الخط العربي The Beauty of Arabic Calligraphy
9 pt. size	جمال الخط العربي The Beauty of Arabic Calligraphy
12 pt. size	جمال الخط العربي The Beauty of Arabic Calligraphy
14 pt. size	جمال الخط العربي The Beauty of Arabic Calligraphy
18 pt. size	جمال الخط العربي The Beauty of Arabic Calligraphy
24 pt. size	جمال الخط العربي The Beauty of Arabic Calligraphy

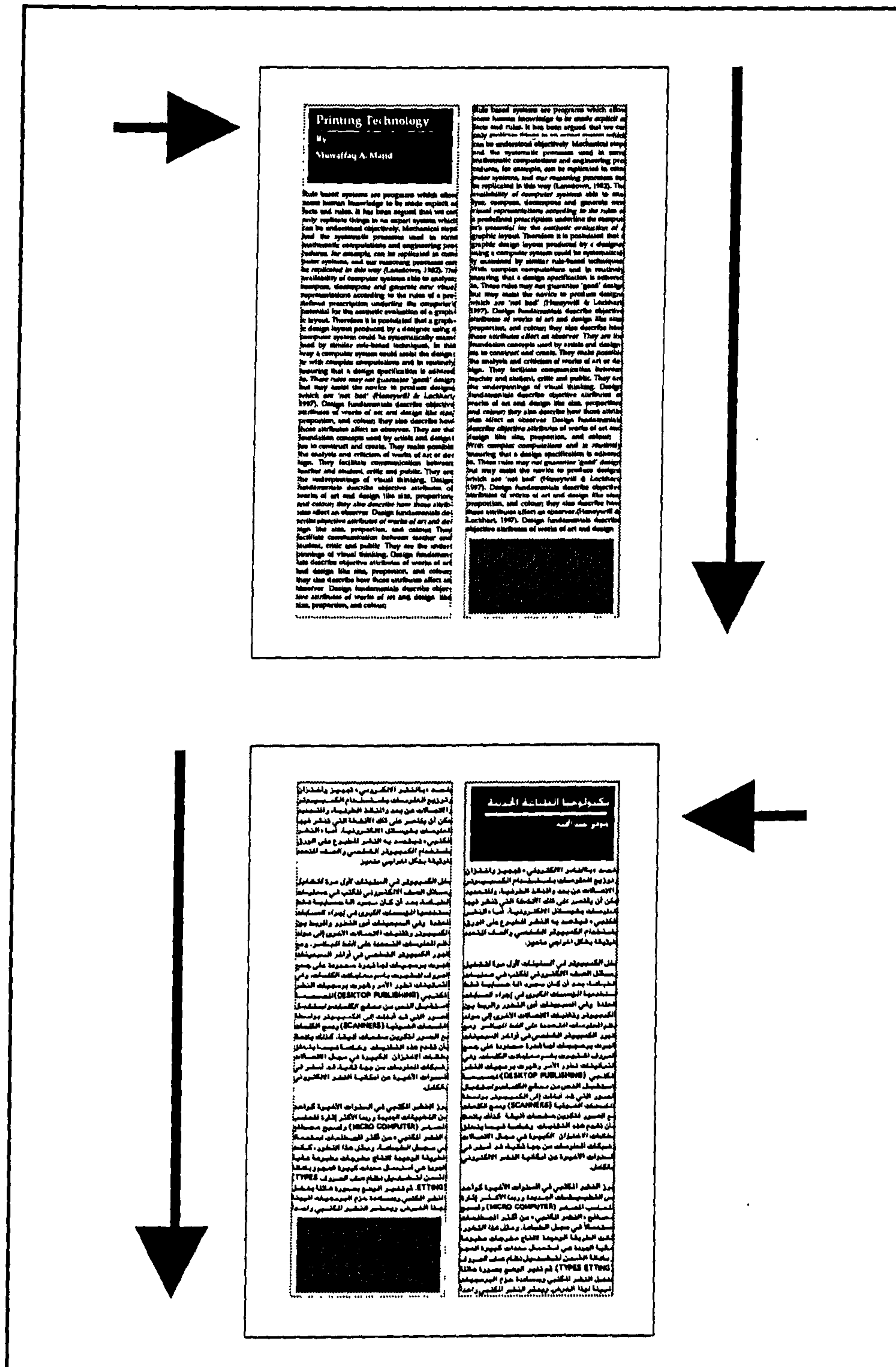
Figure 7.3
A Comparison Between Latin and Arabic Typographic Characteristics and Variations

Typographic Characteristic	Latin	Arabic
Style	yes	yes
Size	yes	yes
Capital	yes	no, influenced by the writing system
Lower-case	yes	no, influenced by the writing system
Body weight	yes	yes
Character extension	yes	yes
Character condensation	yes	yes
Character slant	yes (1 angle)	yes (2 angles)
Character sequence	left to right	right to left
Character relation	disconnected	connected
Spacing between letters	yes	no, influenced by the writing system
Spacing between words	yes	yes

Positioning

Since the character sequence in the Arabic language always reads from right to left and thus has an important affect on the lettering placement and reader orientation, the character relation in Arabic typography virtually always appears in a connected manner while Latin appears as individual letters. The placement rule used for Arabic typographic elements is almost the same as that used with Latin letters except that the sequence of the lettering is exactly the opposite (Figure 7.4).

Figure 7.4
Latin and Arabic Typographic Grid Orientation



Abdullah (1996) addressed the question of Arabic typography by computer. He pointed out desktop difficulties with letterspacing and linespacing in text copy. According to him, the computer offers such a variety of spacing settings for both features, that someone untrained in Arabic typography can find the choice bewildering and wind up making poor selections. He feels that these access devices are becoming more sophisticated technically, but may not be used to the best advantage and, in fact, may overpower text when placed in layouts by an untrained eye. In addition, he sees in the selection of typefaces, one of two extremes. There is either over indulgence in the variety of fonts used, or a limitation to the use of one font exclusively.

Digital Design

The painting and drawing programs which designers first experienced in the mid-1980s were awkward and often clumsy to use but the 'fascination' factor was there and those designers who were beginning to use computers at that time were awed by the tasks the computer could accomplish. The technology has changed and the old programs have been upgraded and replaced with ones that are more sophisticated, more complex, and powerful and which require skill and a great deal of computer memory. The computer has become a new useful tool for illustrators and designers. Intricate and complicated tasks, difficult and impossible to do by hand, can be carried out on the computer.

Many illustrators who began their careers before 1985 are using the computer to supplement their pens, paints, pastels, and other traditional tools. Some have laid the old tools to rest and are working directly on the computer. Others tend to use both the old and new tools in conjunction with each other, working out ideas and concepts for

illustrations on paper with pen or pencil, going to the scanner, and from there to a drawing or painting program to refine the finished product by adding type and other elements. Since many designers are designing directly on the computer, graphics generated on the computer make the design and printing process faster, easier, and considerably less expensive. They save steps in the final printing process. Final page designs are camera-ready and an entire publication can be given to a printer on disk.

‘Digital design’ is an umbrella term for design produced on a computer. ‘Computer design’ has been used as an oxymoron. The availability of sophisticated desktop publishing systems provides novices and experts alike with the ability to prepare a variety of desktop publications. However, there exists some skepticism by professional graphic designers and researchers about the aesthetics of some of the graphic designs produced. They speculate that novices who are unaware of these principles are unable to achieve good design in the production of a desktop publication.

Painting vs. Drawing Programs

There are two different types of software programs which can be used for rendering illustrations — painting programs and drawing programs. They work quite differently from each other. Often these programs are used in conjunction with image-editing and scanning software. Painting programs simulate traditional media. Colours can be mixed on the monitor in much the same way as on a palette. Designers do not have to wait hours or days for the paint to dry and they can get effects which look like watercolour, crayon, oil, and pastel. Brush strokes can be customised to the designer’s needs. Images can be easily duplicated, superimposed, and combined with other images to create a

collage. When a designer uses a painting program, the pixels — the dots which make up the image will be evident (the jagged edges can be seen) (Figure 7.5). The resolution which is seen on the monitor is what will print out, the WYSIWYG (what you see is what you get) factor, unless the image is printed at a high resolution. Type set in a painting program will not appear sharp and crisp. Painting programs are fairly intuitive and relatively easy to use. However, they require a great deal of computer memory.

Drawing programs are vector-based, as opposed to painting programs which are pixel based. This means that, when a designer uses a drawing program, the computer remembers the x, y, and z coordinates for each line created. Object oriented graphics created in a drawing program are defined by paths. Each drawn line follows a path. When the path is closed off, a shape which can be filled with a colour, texture, or pattern is created (Figure 7.6). Drawing programs use the PostScript language code developed by Adobe Systems which enables the computer to communicate with a laser printer or other output device— imagesetter, or film processor. What a designer sees on the computer monitor is not what he or she gets when working with a PostScript image. The printed results he or she gets far exceed the resolution on the screen. The lines, type, and fills used in the drawings will print out smooth and sharp. If graduated fills are used, the final output will show the continuous tones.

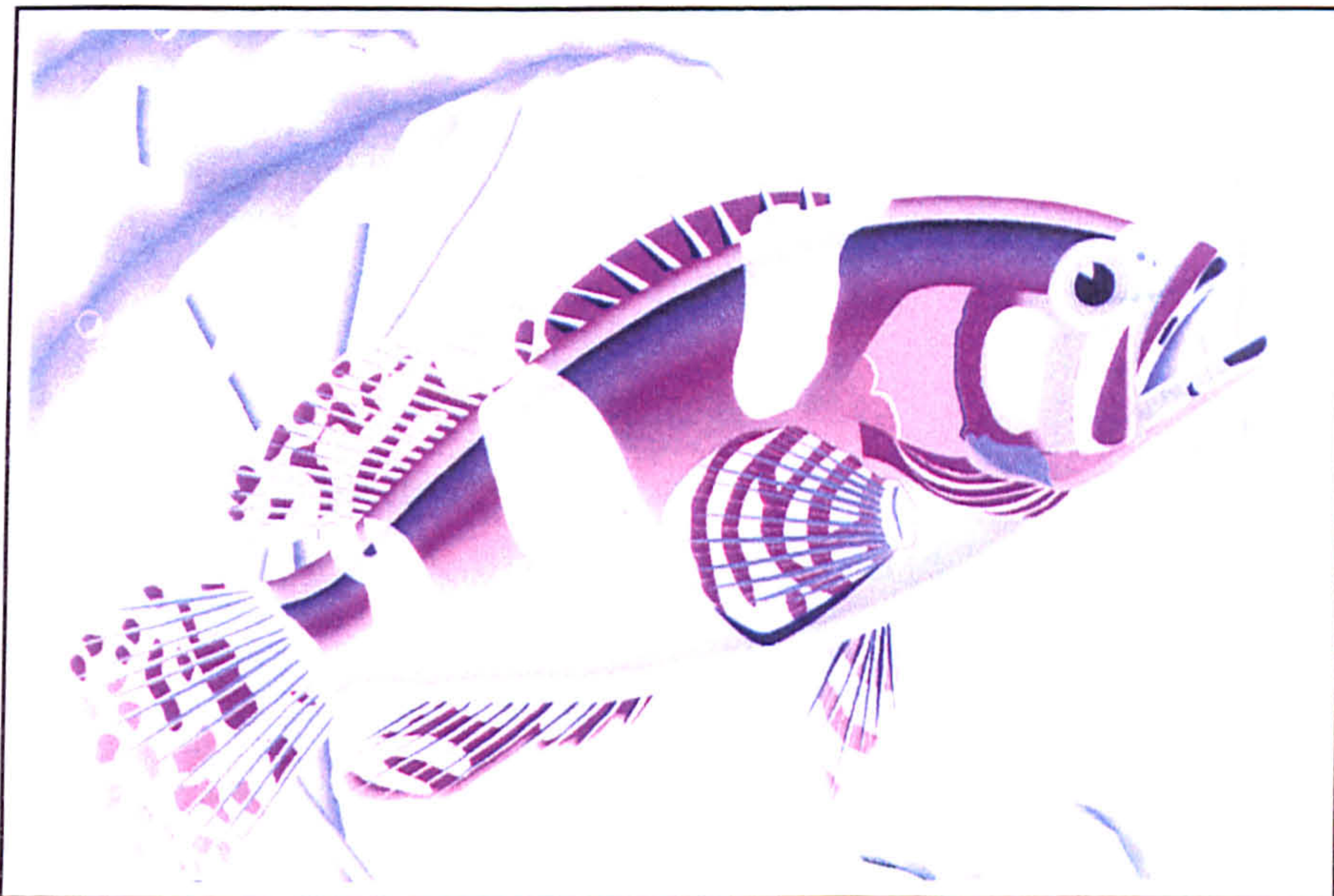
All elements of a page are converted into bitmaps before they are printed, since imagesetters can only print dots on paper or film. This process is called rasterizing. The Raster Image Processor (RIP) acts as an interpreter between an input workstation and an output device.

Figure 7.5
Painting Program



The above image was scanned at a low resolution (pixels can be easily seen).

Figure 7.6
Drawing Program



The above illustration was created in a drawing program as 'object oriented graphics'.

Computer Generated Graphic Devices

Drop caps

A drop cap is a large initial letter that fits neatly and 'drops' into a paragraph. Drop caps can be set into boxes. Arabic does not have capital letters, but a large initial letter does sit on the first line of text in a paragraph (Figure 7.7).

Shaped text on a path

It is possible to create text that conforms to a shape by using the text wrap or runaround function in the page layout program (Figure 7.8). Shaped text can also be created in a drawing program.

Enlarged numbers

Large numbers, ones that are larger than the point size of the body text, can be used to create visual interest and draw the reader's attention to information on a page (Figure 7.9).

Typographic ornaments

Typographic ornaments are decorative devices in the form of curlicues, flourishes, and brackets and can be found in fonts or clip art (Figure 7.10).

Dingbats

Dingbats are decorative devices, graphic symbols, which can be used as bullets when listing items that do not follow an order of importance (Figure 7.11).

Pull quotes or call outs

Pull quotes and call outs are quotes from an article which are pulled out of the body copy of the text (Figure 7.12).

Figure 7.7
Dropped Arabic Letter



أكثر إشرافاً توفرت فيه
مجموعة فريدة من الطائرات
الحديثة ، كرم الضيافة العربية
التقليدية ، والخدمة المطورة
التي تتميز بها خطوط جوية
الكويتية اليوم .

كل ما عليك أن تفعله هو
الاسترخاء والاستمتاع بالخدمة الرفيعة التي نوفرها لك على
مقن طائرات الخطوط الجوية الكويتية إلى أي من محطاتنا
الدولية التي تزيد عن اثنين والثلاثين . إننا نتطلع
للترحيب بك قريباً في رحلاتنا .



الخطوط الجوية الكويتية
روح جديدة لخدمة متطورة



فرصة جديدة لتقديم أرفع خدمة من نوعها
في الخليج . منذ اللحظة التي نستخدم فيها
لمكتب إتمام إجراءات السفر وحتى آخر
المطاف عندما تصل إلى مقعدك النهائي ، فإنك ستلقى
منا معاملة تفوق تلك التي يحظى بها كبار الشخصيات .
فإننا لانعجبك
شخصاً مهماً
فحسب بل
ونعدك صديقاً
الدائم . وتجدر
أن نطأ قدمك
الطائرة فإنا
ننهدك بدرجة استثنائية من الراحة والعناية مهما كان اختيارك
من بين درجات السفر الثلاث .
إن نحادث في مواجهة تحديات الماضي ، نطلق بنا إلى مستقبل



Figure 7.8
Shaped Text on a Path

قوانين
الايحارات
الاستثنائية
ان القوانين السلمية لقوانين
الايحارات الاستثنائية بدأت تأخذ المعنى
الخطير ابتداء من العام ١٩٧٧ يوم توقف العمل
بقانون ١٩٧٤ ، فتمت البلاد من دون أي قانون
للايچار حتى ١٩٨٢/٩/٩ واليوم تتكرر
الاستثنائية بعد انتهاء مفعول القانون الرقعة
٨٢/٧٠ وتعديله في العام ١٩٨٣ في
١٩٨٦/٧٢/٣٦ تعود منذ ذلك الحين طبيعة
كسيرة في سوق الايچارات لتتبع اصحاب
المساكن طوال تلك المدة عن تأخيرها ، توقفها من
البعض ان القانون المقبل سيفرض مبدأ التعاقب
الحري ، وتخصيصا من البعض الآخر ان القوانين
الاستثنائية للايچار تملك المساهم
بعد اوائل الاربعينات عرف لعمام تشريعات
استثنائية للايچارات خرجت احكامها
عن المبادئ والقواعد القانونية



Figure 7.9
Enlarged Numbers



Figure 7.10
Typographic Ornaments



Figure 7.11
Dingbats

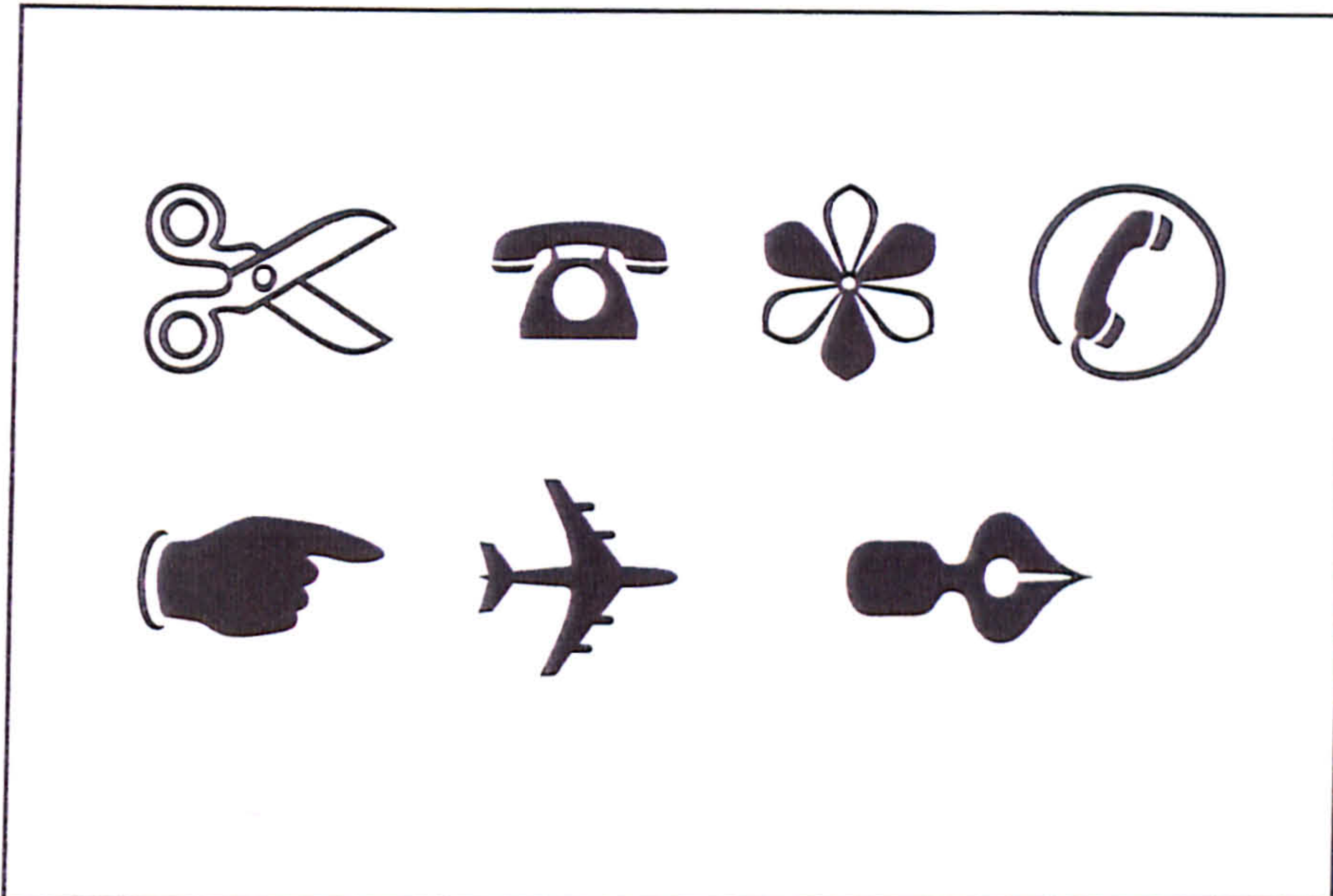


Figure 7.12
Pull Quotes



Lines/rules, dots, checks, and stripes

Lines or rules provide a means of dressing up a page. The rules can be solid, dotted, created with symbols, or made out of a pictorial typeface. Too many rules will confuse the reader and make the page look busy and uninviting (Figure 7.13).

Geometric shapes

Circles, triangles, stars, boxes, borders, dots, and others — can be put on a page of the publication to create visual interest (Figure 7.14). These should be used sparingly in a way they do not interfere with readability.

Boxes or borders

Important information can be separated from the body of text and put in a box or within a border (Figure 7.15). The box or border will call attention to itself and tell the reader to pay attention to the information presented. Borders can be created in a drawing program or with decorative/pictorial fonts.

Special effects with type

Type can be manipulated in a variety of ways such as pasted into, soft and dropped shadow, graduated fill, embossed, feathering, radial fill zoom text, patterned fill, text bound to a path (Figure 7.16).

Digital image manipulation

Photographs can be altered on a computer to create a different ‘truth’. (Figure 7.17)

Logotype

A logotype is a logo or symbol created with letters (Figure 7.18).

Figure 7.13
Lines, Rules, Dots, Checks, and Stripes



Figure 7.14
Geometric Shapes



Figure 7.15
Boxes and Borders



Figure 7.16
Special Effects with Type



Figure 7.17
Digital Image Manipulation

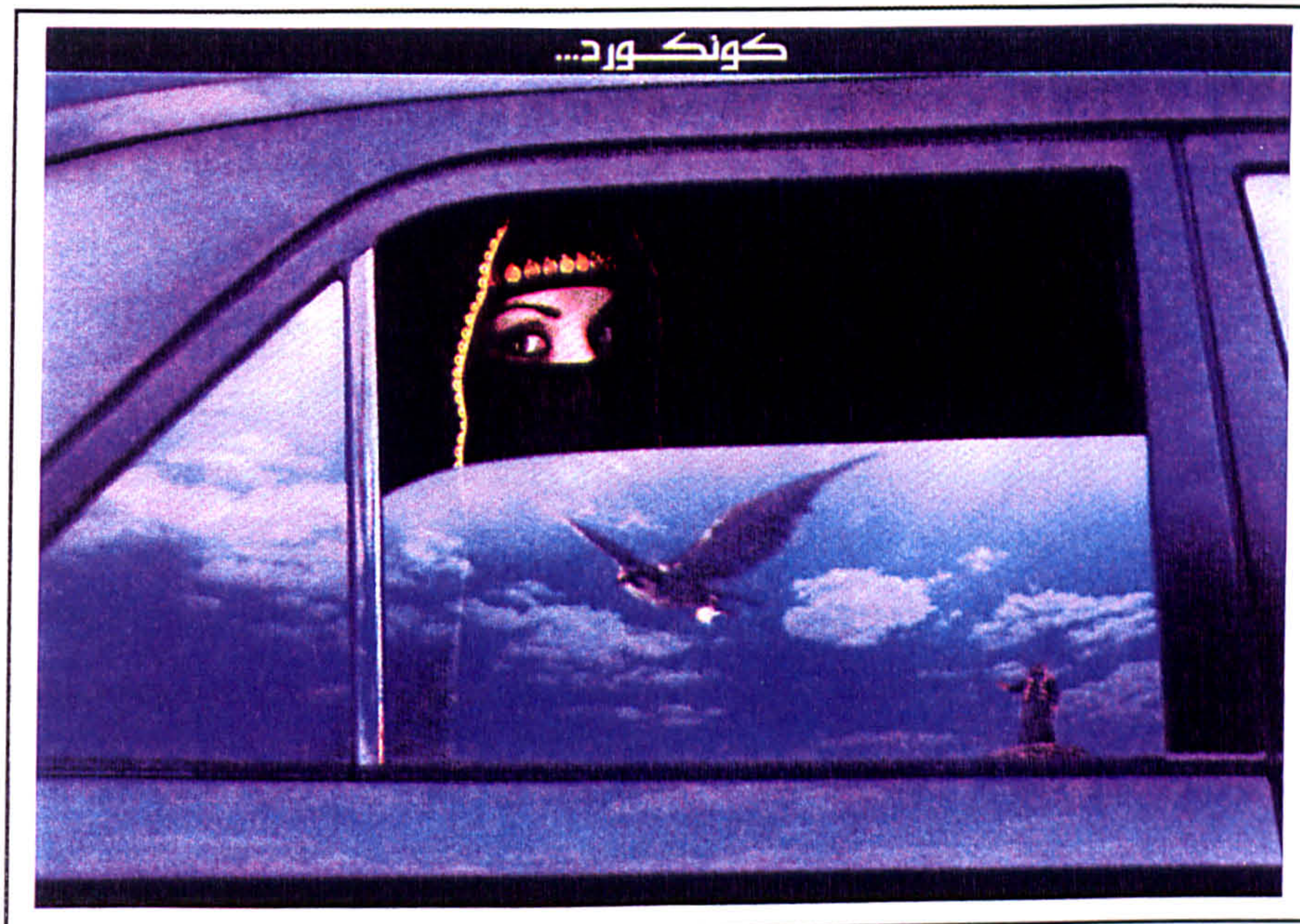


Figure 7.18
Logotype



Special effects — 3D

An illusion of depth can be created in a drawing program, or a 3D program can be used to give a sense of perspective and to add another dimension to what would otherwise be a two-dimensional drawing (Figure 7.19).

Background textures

Background textures or patterns provide a good, inexpensive way to be illustrative, to dress up a document, and to make a page more interesting visually. Any patterned material can be scanned into an image-editing program to get an interesting texture. Images could also be used as background textures (Figure 7.20).

Digital clip art

Clip art is a finished art by artists and photographers using a number of different styles. By definition, clip art is art that is uncopyrighted, art which can be used without permission. Clip art was originally created for designers who were creating newspaper ads at the turn of the century and needed illustrations in a hurry. It is still used for that purpose, but with the arrival of the desktop computer its use is wider. Clip art provides a good means of illustrating publications. The negative side of clip art is that it is available to the general public and many of the images have been overused. There is a good possibility that the selected images will have appeared in dozens of other publications as well. Overused images become stale quickly and are easily overlooked. But on a more positive note, clip art can be altered and customised to suit a designer's needs. Most clip art is of US origin and often has little direct relevance to Arab experience (Figure 7.21).

Digital information graphics

Information graphics — charts, graphs, tables, maps, and diagrams — (Figure 7.22) are a way to add visual or graphic interest to a page while providing statistical data. Information graphics have become a significant presence in our information-ridden society. They provide a means to present facts that cannot be shown with drawings, photographs, or other forms of illustrations. In the 11th century, charts were used to show the orbits of planets. Maps were used early in our history to indicate location and direction. Edward Tufte (1992), author of several books on the presentation of statistical information, says of information graphics, “Graphical excellence is that which gives the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space...Data graphics should draw the viewer's attention to the sense and substance of the data, not to something else.” On September 15, 1982, *USA Today* made its first appearance on news stands — an event that sent off reverberations throughout the entire newspaper industry. *USA Today* is reputed to use charts and graphs extensively to help readers grasp complex information quickly. The newspaper has made an impact on the newspaper and magazine world. Charts, graphs, maps, diagrams, and tables should be used to illustrate data that may otherwise be uninteresting. The illustrator or designer's role in the creation of information graphics is to present the information in a way that is aesthetically pleasing, illuminating, and easy to read and understand at first glance.

Boutros (1992) notes that computer-based graphic devices often lack typographical sense when used in an excessive way. He points to the above graphic devices which are accomplished easily by computer, for instance geometric shapes such as rectangles, circles, and triangles used as decorative devices, run solid or screened behind copy.

Figure 7.19
3D Special Effects

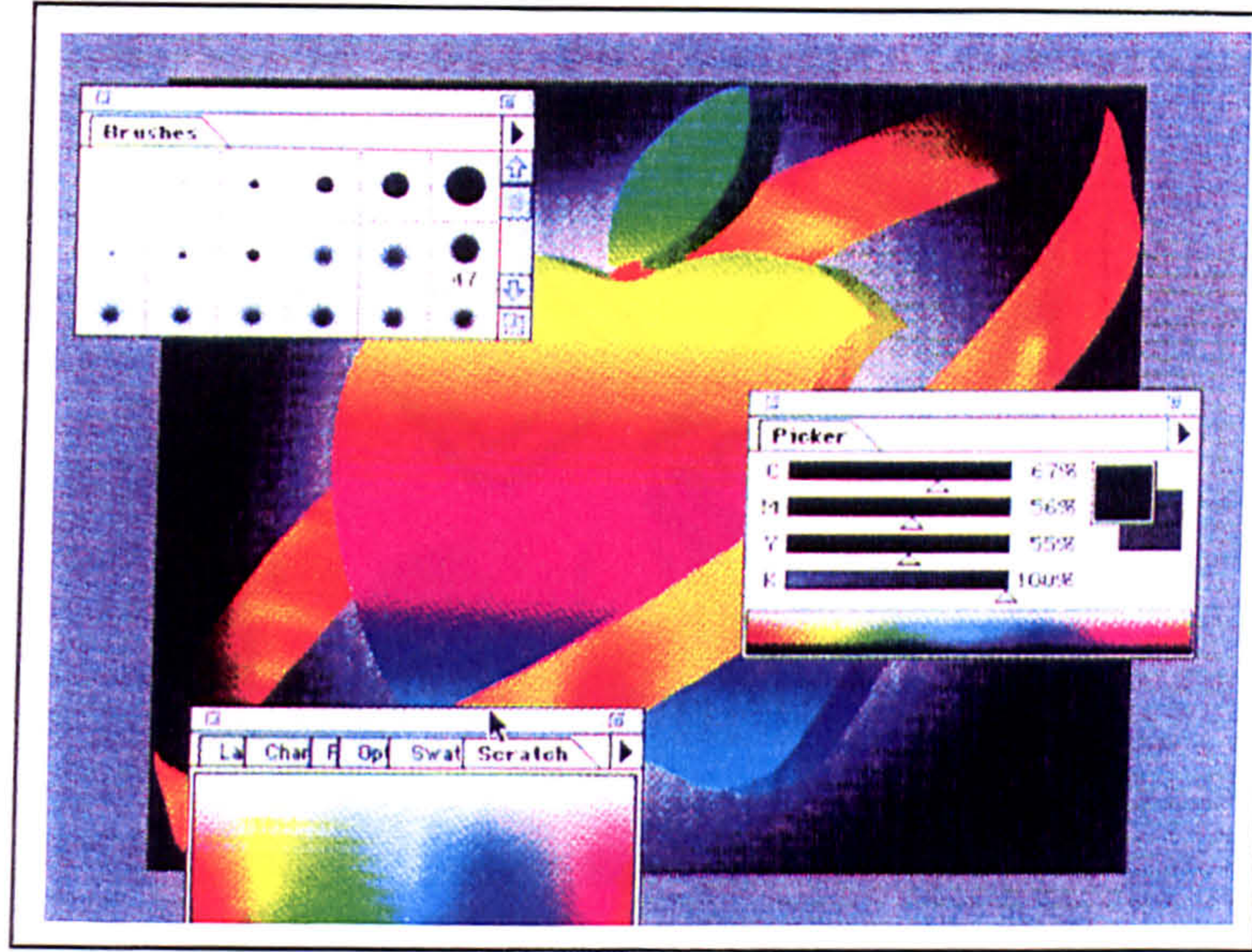


Figure 7.20
Images as Background Textures

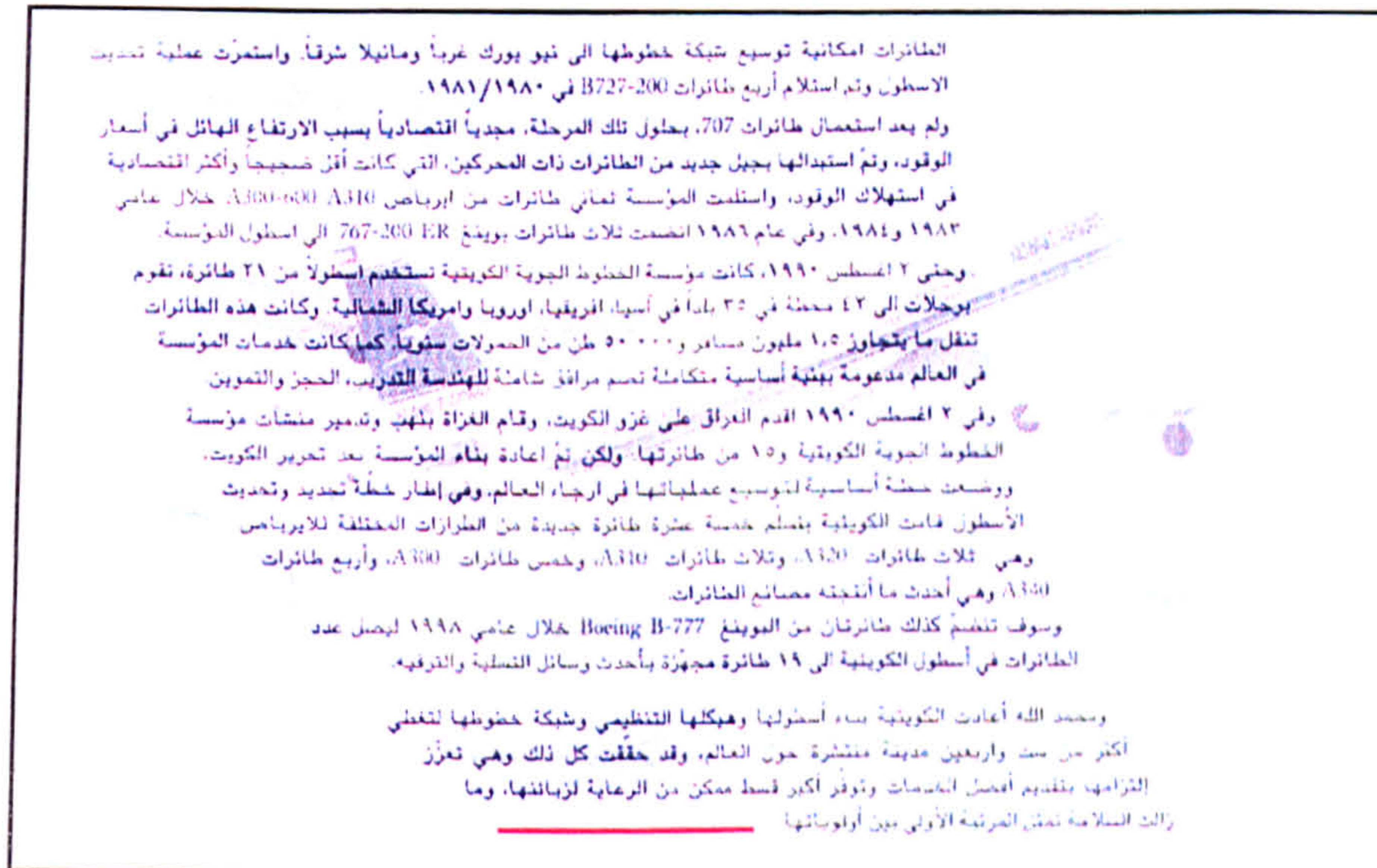


Figure 7.21
Digital Clip Art

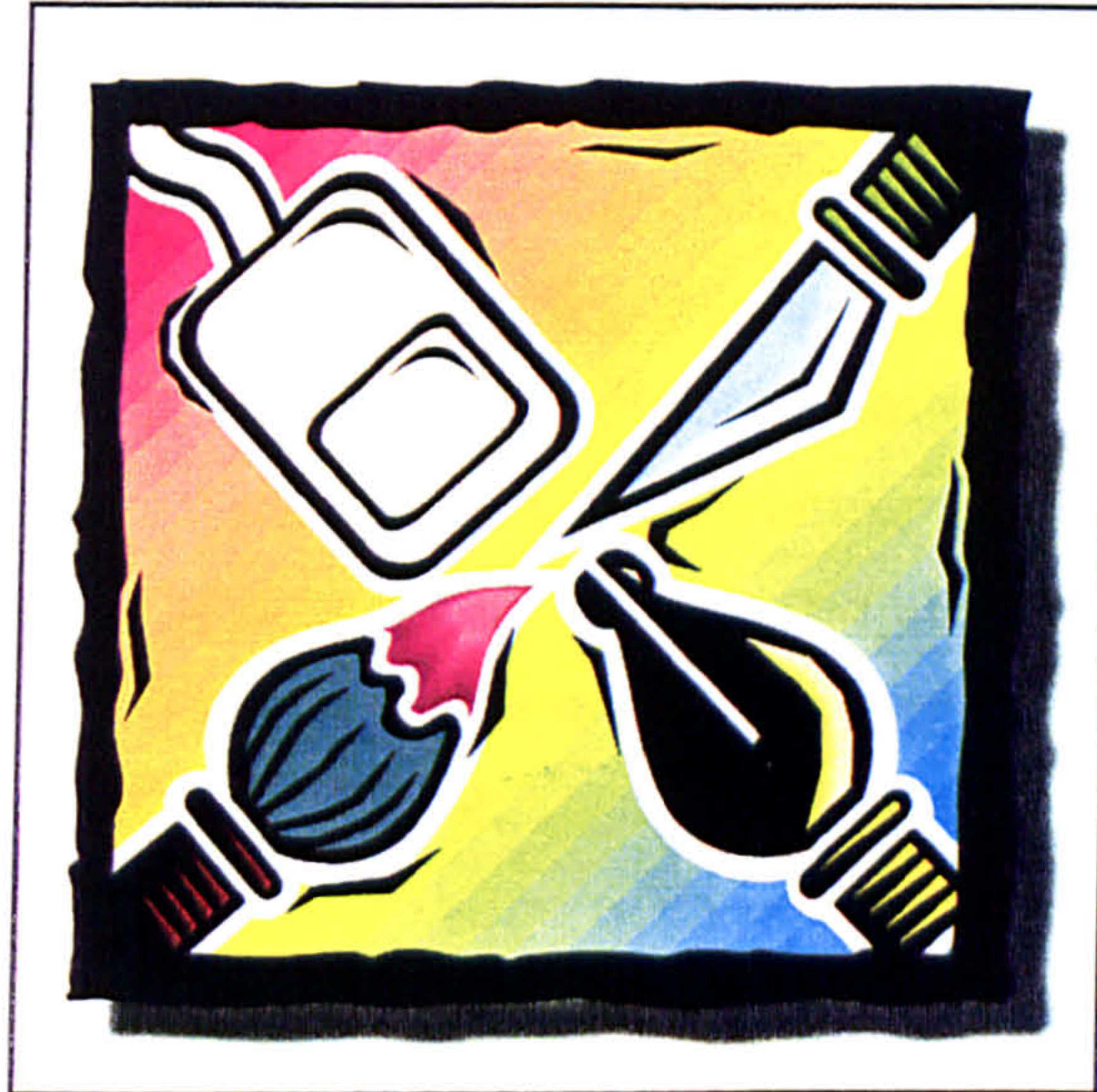


Figure 7.22
Digital Information Graphics

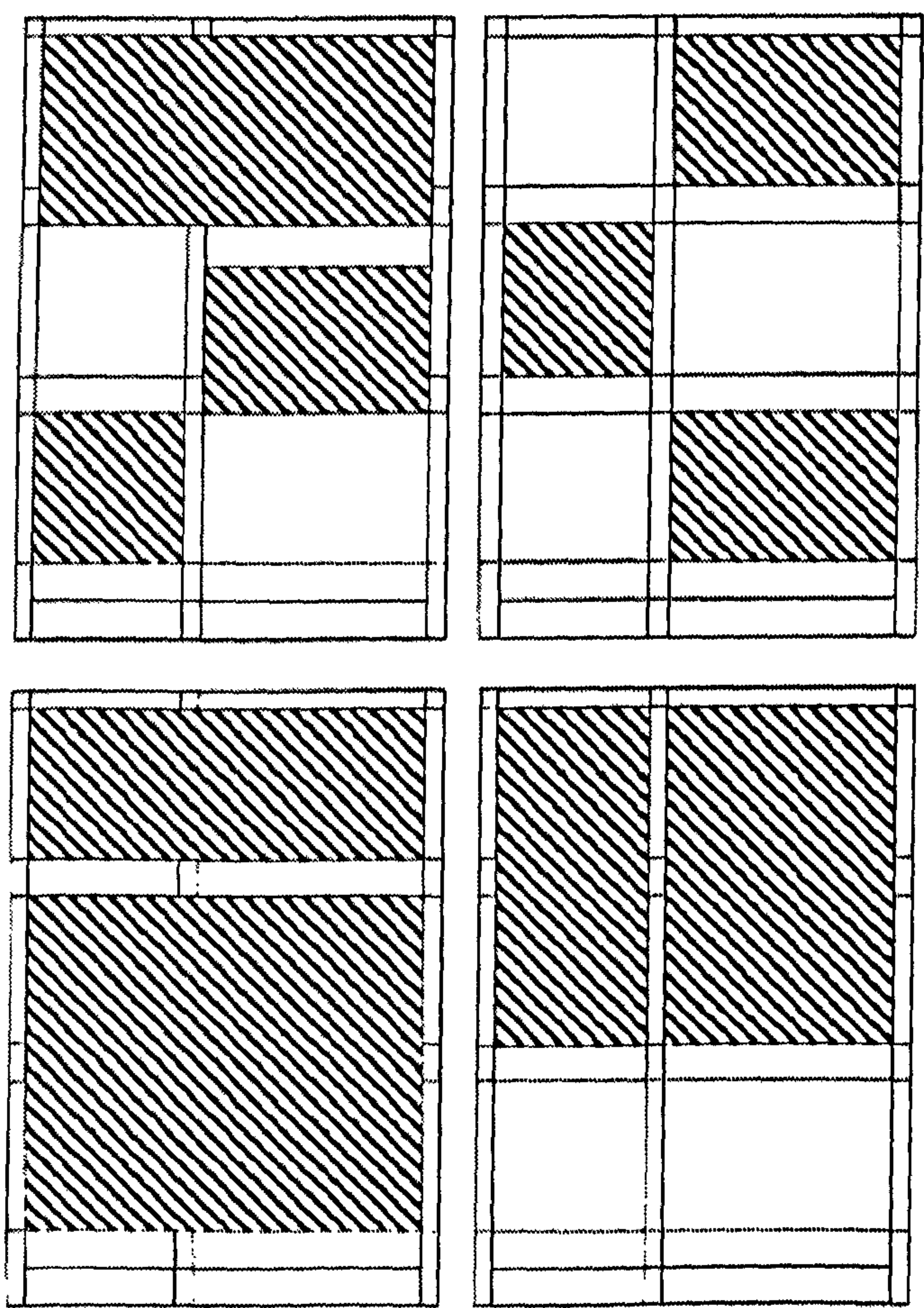


Overall Design Approach

The Typographic Grid

A typographic grid provides a framework for page design. It is a modular, two-dimensional grid that employs the X (vertical) and Y (horizontal) axes of Cartesian coordinate space. The grid creates an underlying foundation for page design and promotes continuity in a publication even when individual pages have apparently different configurations. The typographic grid uses a rectangular or square module within which the relative areas of text, image, margins, and columns are manipulated (Figure 7.23).

Figure 7.23
The Typographic Grid



Most computer layout programs offer what are known as 'master pages' to simplify the task of maintaining layout uniformity throughout a multipage document. Elements or parameters that are applicable to every page — column dimensions, pagination, margins, structural lines, etc. — need only be specified once on the (left and right) master pages, after which corresponding features are incorporated automatically into successive pages as they are created. In a similar way, many programs permit one to establish at the outset typographic characteristics applicable to various kinds of paragraphs — line spacings, type sizes, indentations, etc., for normal paragraphs, freestanding equations, figure captions, section headings, and the like. These are defined in what is known as a style sheet (Wills, 1997). Subsequently applying one of the predefined styles to any specific paragraph causes that paragraph to acquire immediately all the appropriate typographic characteristics. The availability of Arabic desktop publishing layout programs like 'Al Nashir Al Sahafi' (Arabised version of Letraset's 'Design Studio') provides the opportunity for new approaches and offers the potential for further experimentation in the search for new solutions and the departure from earlier stereotypes and convention. However, these systems rely on the use of a grid system to ensure structural integrity in the composition of an individual piece and serial uniformity where a document consisting of two or more pages is being prepared.

Order and clarity are achieved by a grid structure. The grid structure brings efficiency to the process, for the designer organises material on each page within established spatial and typographic parameters. Without this graphic program, the designer would have to develop a design plan for each page. Much time would be consumed, and the pages would be inconsistent. Even the most rigorous grid is no substitute for the designer's sensitive eye for balance. The grid provides

a framework, but the designer still must make careful decisions about the size and placement of the elements and their relationship to one another. By changing the parameters of the grid, designers can alter the visual properties of the page.

In discussing the grid, Muller-Brockmann (1981) stated that information presented with clear and logically set out titles, subtitles, texts, illustrations, and captions will not only be read more quickly and easily, but the information will also be better understood and retained in memory. As a valuable framework for structuring typographic and pictorial elements, the grid produces a cohesiveness which can improve legibility and the communication of ideas.

Symmetry and Asymmetry

The word symmetry has two meanings. Its general use denotes well-proportioned and balanced parts, with a beauty resulting from the ordering of the parts to form a whole. More specifically, it means the similarity of form or arrangement on either side of a dividing line or plane. The symmetry found in nature, including the symmetrical character of the human body and face, is a powerful impetus for symmetry in art and design. Bilateral symmetry is the placement of equal form and weight on both sides of a dividing line. Early printers used bilateral symmetry as an organising principle to bring order and unity to the printed page, and many advertising art directors favour it to produce a symmetrical sequence of image, headline, and body copy.

The nuances and attributes of typographic symmetry have been considered by Tschichold (1997), Twyman (1992) and Meggs (1992). It is Tschichold's view that there is no such thing as symmetrical typography. He explains that the word symmetry may not be used

when we talk about typographical arrangement, because something is symmetrical only if one half is the mirror image of the other half. Symmetry is by his definition unattainable except in centred imagery or centred text. The term 'centred typography' he suggests more accurately describes a series of lines which are set with equal space at opposite ends.

Tschichold (1997) suggests that good typography has a simple structure. The centred line is a specific and indeed supremely important structural component in good typography. He contends that to centre lines of different weight and type size one beneath the other is at the same time the simplest and the best typographical method. But centred lines of type do not produce symmetrical typography. Symmetry is attainable only when applied to centred imagery.

Twyman (1992) reports the use of bilateral symmetry in the design of the double page spread. He describes bilateral symmetry as the mirroring of two facing pages of a book, and gives reasons for its popularity from medieval times. He contends that the argument for symmetry in book design is more convincing than any that can be applied to symmetry in, for example, architecture. Asymmetric design he reports became accepted in the twentieth century by British designers.

The modern art and design movements of the early twentieth century rebelled against symmetrical balance and embraced asymmetry, which traditionally meant the lack of proportion between the parts of the whole, or the lack of symmetry. Asymmetry has been redefined as dynamic equilibrium or the creation of order and balance between unlike or unequal things. Meggs (1992) observes that a decision to use

symmetrical or asymmetrical composition should grow out of the subject matter and design intent, for both can be effective approaches to graphic space.

Visual Hierarchy

A visual hierarchy is an arrangement of elements in a graduated series, from the most prominent to the least prominent, in an area of typographic space. When establishing a visual hierarchy, a designer carefully considers the relative importance of each element in the message, the nature of the reader, the environment where the communication will be read, and the need to create a cohesive arrangement of forms within the typographic space.

The study of visual hierarchy is the study of the relationships of each part to the other parts and the whole. When elements have similar characteristics, they have equality in the visual hierarchy, but when they have contrasting characteristics, their differences enable them to take dominant and subordinate positions in the composition.

Contrast between elements within the space is achieved by carefully considering their visual properties. Important contrasts used to create hierarchical arrangements include size, weight, colour, and spatial interval. The location of an element within the space plays an important role in establishing a visual hierarchy. The spatial relationships with other elements can also influence an element's relative importance in the arrangement.

When creating a visual hierarchy in typographic space, a designer balances the need for harmony, which unifies a design, with the need for contrast, which lends vitality and emphasis. As in music, elements

can have a counterpart or a counterpoint relationship. Typographic counterparts are elements with similar qualities that bring harmony to their spatial relationship. Elements have a counterpoint relationship when they have contrasting characteristics, such as size, weight, colour, tone, or texture. Counterpoint relationships bring opposition and dissonance to the design.

Typography's hierarchical order derives from the basic process of pattern-forming found in nature, in verbal and written language, the arts, and computer technology. This is aptly described by Doczi (1981), speaking of his research on proportional harmonies in art and design:

The rhythms of writing are created by the same pattern-forming process of sharing that creates rhythms of dance, music and speech. Movements shared make dance, patterns shared make music and speech. The shared patterns of typography find expression through visual dynamics that enable it to function as both a message-carrier and a rhythmic, visual structure. The typographic message, with all its limitless thought and diversity of form, is shaped by this subtle and meaningful hierarchical language.

Semantic Structures of Text

In a study of the 'Graphic Translatability of Text' which was carried out as a part of a British Library project, Norrish (1989) states that "text has a semantic base (meaning) and is organised into units (e.g. words, sentences, lists, headings, equations and formulae). All texts are composed of one or more such units. The number and kind of units and the ways in which they are related to each other constitute the structure of a specific text". Semantic structures are of vital interest to the computing community now that documents can be produced on computer-based systems necessitating a priori approach to document design.

Traditionally the design of documents was carried out after the document was written, by people highly trained and skilled in editing, designing and preparing manuscripts for production. Computer-based systems however give the originator the opportunity to take the document through all the stages needed for production. This causes problems, as originators are usually not trained in editing and design skills and have rarely had to produce a great variety of realisations of text structures, although they are able to use and understand them. The models of text which are offered to those originating and producing documents on computer-based systems are criticised by typographers for being oversimplistic and appearing to pay scant attention to the appearance of real documents and the needs of the user. The typographer's worry is that the clarity, consistency and diversity with which structures can be realised will be lost and the reader will suffer in consequence. (Norrish, 1989)

The Language Element in Graphic Design

Waller (1987) has directly addressed the relationship between typography and content. Using a model of typographic genres, he illustrates that the language element underlying typography is linguistics. The conclusion from his study is that there is a language element of graphic communication which underlies typography, and that it should be studied seriously in much the same way as linguistic scientists have studied spoken language.

There are other visual attributes of written language which have no spoken equivalent. Waller (1987) found that the quality of difference between graphical elements is at the heart of language.

The obvious place to investigate the language element underlying typography is linguistics, and some textbooks do indeed mention the terms 'graphetics' and 'graphological' in symmetrical opposition to 'phonetics' and 'phonology'. (While phonetics describes simple characteristics of vocal sounds in speech, phonology describes systems and patterns of sounds.) However, this definitional symmetry should not

be taken to imply that graphic and phonic factors enjoy an equal status within linguistics. In practice, graphetic and graphological factors have not received anything like the detailed attention that linguists give to phonology.

Waller (1987) clarifies the graphetic/graphological distinction in the following way:

Taken individually, visual techniques such as the design of letterforms, symbols, rules, tints and boxes might be seen as graphetic; but when they are used together to structure a whole text, we see a graphological system at work. The origin of the serif, the design of more legible type, the choice between the open and closed bowl 'g' are examples of graphetic issues, interesting in themselves but not contributing to our understanding of how graphic factors are used in the display of textual arguments. For example, two editions of Shelley's poems, the one set in Bodoni and the other set in Universe, may differ from each other and the original manuscript at the graphetic level (being set in different types) but both are expected to follow the author's original graphology—his use of indention, capitalization, punctuation and spacing.

Typographic Readability and Legibility

In typography, legibility is taken to mean 'easily read'. Therefore, legibility is to some extent open to personal interpretation, and is influenced by many factors, such as the intended audience for the type, the circumstances under which it would be viewed, and the purpose for which it is displayed. It should be kept in mind that legibility may not always be a designer's top priority (although illegibility is more usually due to carelessness). In advertising, text is often set more to catch the eye than to deliver meaning. It has also become fashionable in recent years for typestyle to comment upon the content of a text, frequently at the expense of legibility.

In a rapidly changing information environment, designers must constantly reassess the nature of typographic legibility. As technology changes, so do communication techniques and methods. Today, legibility research must proceed beyond the realm of printed communications into the world of electronics, for words that once appeared primarily on paper are now found on the cathode-ray tube. Legibility concerns extend into all media, including videographics, television broadcasting, computer graphics, film, and laser graphics.

Symbol and Culture

Culture is the social structure which establishes what is important to a particular group of people. It determines to a great extent how objects and events are perceived and what responses must be made to them. Cultures and their institutions establish the meanings of symbols. A symbol is something which represents something else. Symbols link two previously unconnected things, usually a visual image and an idea. Symbols are specific to their cultures. A corporate logo is a simple image which stands for a complex organisation. The Coca-Cola script logo is said to be the world's most recognised symbol, but no symbol is truly universal. A symbol has meaning only when that meaning has been learned.

Graphic design has a synergistic relationship with the social milieu in which it occurs. It is shaped and formed by its culture. In turn, it helps shape and form the culture. It is neither an art nor a science; rather, it is a hybrid form of public communication that calls upon its practitioners to be visual editors, graphic inventors, and form builders. Because graphic designers speak with a public voice, their signs, symbols, and images are of necessity the signs, symbols, and images of their audience.

Development of the Instrument

The Arabic design analysis instrument (Figure 7.24) was formed to accommodate all of the above considerations. Therefore, it was divided into three areas covering *typography*, use of *graphic devices*, and overall *design approach*. Each area included a list of sub-categories or features associated with computer assisted page design.

Creating this instrument involved identifying Arabic design features characteristic of computer prepress. By scoring the presence of these features, the instrument was used to determine which characteristics appeared with greater frequency. It also was used to indicate whether those characteristics tended to be subtle and not very easily detected by an untrained eye, or whether they were easily noticeable.

By examining each category in the instrument, an attempt was made to root out sub-categories based upon patterns of significant concerns by a panel of experts. The establishment of categories is not an exact science, of course, for in selecting entities to be counted, the researcher is guided largely by intuition. This is where 'art' rather than 'science' plays the prominent role (Rapoport, 1969). But as Carney (1972) points out, "no content analysis is better than its categories, for a system or set of categories is, in essence, a conceptual scheme". To develop a consistent profile of the various categories and sub-categories, the instrument was developed based on some of the materials and the literature reviews and any useful and relevant aspects of the survey questionnaires were incorporated as categories. The instrument was built around 40 features characteristic of computerised design. Each feature was scored "1" if it was present and "0" if it was not. Therefore, the highest possible score was 40. A space was provided for written comments for each publication. Chapter 10 concisely sets out the content analysis results.

Figure 7.24
ARABIC DESIGN ANALYSIS INSTRUMENT

Typography	Graphic Devices	Overall Design Approach
<div>_____ Use of Arabic typefaces (overuse)</div> <div>_____ Letters with jagged edges (bitmapping)</div> <div>_____ Manipulation and distortion of type — stretching, rotation, shadows</div> <div>_____ Inconsistent kerning and trapping of letters</div> <div>_____ Screened and filled type</div> <div>_____ Elaboration around initial letters (drop caps)</div> <div>_____ Inconsistent letterspacing in justified columns</div> <div>_____ Inconsistent spacing between lines or paragraphs</div> <div>_____ Poor alignment of lines of copy across columns of type on a page</div> <div>_____ Incorrect automatic text flow</div> <div>_____ Uncontrollable hyphenation (Arabic letters cannot be hyphenated)</div> <div>_____ Rotated and skewed text</div> <div>_____ Inconsistent leading (space between lines)</div> <div>_____ Inconsistent line weights</div>	<div>_____ Graduated fills of colour in screens</div> <div>_____ Shadow boxes/drop shadows</div> <div>_____ Overuse of geometric shapes — circles, triangles, ovals, polygons, etc.</div> <div>_____ Vertical column rules set in tiny dots</div> <div>_____ Inconsistent alignment of objects</div> <div>_____ Bitmapping of images (use of low resolution images)</div> <div>_____ Runaround text (text wrapping)</div> <div>_____ Use of 3D graphics</div> <div>_____ Arabic font creation (by using FontStudio and Fontographer)</div> <div>_____ Use of signs, symbols, and esoteric markings (Zapf Dingbats)</div> <div>_____ Wrapping text around 3D object (texture mapping)</div> <div>_____ Rotated and skewed objects</div> <div>_____ Positioning a light source over objects</div> <div>_____ Use of digital information graphics</div> <div>_____ Use of background textures</div> <div>_____ Use of enlarged numbers</div>	<div>_____ Inconsistent grid widths</div> <div>_____ Design feels fragmented. Emphasis is on parts of layout, on graphic devices, rather than on design as a whole</div> <div>_____ Design built around gimmicks (boxes, rules, distorted type, shadows, screens)</div> <div>_____ Overuse of digital clip art</div> <div>_____ Large paragraph indents</div> <div>_____ Hanging indents</div> <div>_____ Choice of graphical elements which detract from content</div> <div>_____ Inconsistent use of symmetrical/ asymmetrical design</div> <div>_____ Absense of visual hierarchy principles</div> <div>_____ Lack of typographic legibility</div> <div> <div>Comments:</div> <div></div> </div>

Publication Examined: _____

This instrument emerged from an examination of three kinds of sources: the assertions of Arabic writers in various computer-oriented magazines; the comments of designers and art directors who work with the systems; and my own observations from a close look at a number of computer-designed and non-computer-designed Arabic magazines.

Validity and Reliability of the Instrument

Validity information is concerned with the degree to which the test is capable of achieving certain goals. There are several types of validity corresponding to different aims of testing. Content validity is especially important for achievement and proficiency measures based on observation in selected situations (Oppenheim, 1992). The purpose of content validity, according to Oppenheim (1992), is to assess whether the items adequately represent a construct of specific interest. In other words, content validity is concerned with the extent to which an instrument measures what one thinks it is measuring.

Panel Selection

A panel of twelve professionals in the field of graphic design were asked to express their level of agreement with the instrument's categories and sub-categories, develop the categories, and prioritise the sub-categories. The twelve individuals were considered representative of experts in Kuwait on Arabic magazine design. These individuals were viewed as competent to make judgments about factors necessary for the success of the instrument.

To assure content validity, all criteria used for the evaluation were examined by a panel of eight experts from both academia and private practice. The criteria used for selecting the experts consisted of indicating persons who were involved in graphic design teaching or

professional practice with three or more years of experience. Then a letter was sent to each prospective panel member to request their assistance.

In order to achieve validity in the instrument, the appropriateness of the terminology used in the instrument was very important. Because of the experts' professional knowledge and experience, their comments and suggestions provided a great number of improvements for the instrument. The terminology in the initial instrument was modified and some items were added to the revised instrument. The revised instrument was then pilot tested with a group of 10 persons who included teachers, graphic designers, graduate students, and undergraduate students majoring in Visual Communication at Kuwait University.

Value Judgment and The Delphi Technique

The literature on cognitive abilities and human problem solving does confirm that individuals differ considerably, based upon their cognitive abilities (Benbasat & Taylor, 1982), in their ability to deal with different aspects of a problem solving situation. This depends upon such psychological dimensions as their ability to deal with abstraction.

The Delphi technique was applied to ascertain the level of agreement of experts regarding the content categories of the instrument. The Delphi technique is a research method designed to achieve consensus on various issues or recommendations. Delphi may be characterised as a method for structuring a group communication process, so that the process is effective in allowing a group of individuals, as a whole, to deal with complex problems (Linstone and Turoff, 1975). A group of experts serve as a panel to accomplish controlled interaction to the

instrument. Three features of the Delphi are: 1) anonymity of individual responses; 2) controlled feedback; and 3) a defined statistical presentation of group responses. One of the specific advantages of the Delphi method is to allow individuals with differing perspectives and/or differing cognitive abilities to contribute to those parts of a complex problem for which they have both the appropriate knowledge and appropriate problem solving skills. Perhaps the most important and least understood property of the Delphi method is the ability of members of a group to participate in an asynchronous manner. This property of asynchronous interaction has two characteristics:

- A person may choose to participate in the group communication process when they feel they want to.
- A person may choose to contribute to that aspect of the problem to which they feel best able to contribute.

Anonymity

Perhaps the property that most characterises the Delphi method is the use of anonymity. Typically, in the Delphi method there is no identification of who contributed specific material or who made a particular evaluative judgment about it. The primary reasons for anonymity are:

- When ideas are introduced within a group where severe conflicts exist in either 'interests' or 'values,' the consideration of an idea may be biased by knowing it is produced by someone with whom the individual agrees or disagrees.
- The high social status of an individual contributor may influence others in the group to accept the given concept or idea.
- Conversely, lower status individuals may not introduce ideas, for fear that the idea will be rejected outright.

In essence, the objective of anonymity is to allow the introduction and evaluation of ideas and concepts by removing some of the common biases normally occurring in the face-to-face group process.

In summary, it is safe to say that many of the old and new graphical devices that are used in Western typography are applicable in the Arabic case too. Moreover, many Western design rules also seem to transfer to the Arabic case. The previous chapters provided the structural developmental framework in which to understand the impact of the new technology and the transformation of the craft occupations in this industry as the central aspect of this study. The next chapter reports the findings of the study. It presents the results of the analysis which is built around the questionnaires.

Chapter 8

DATA ANALYSIS AND RESULTS

Findings of the Managers' Survey Questionnaire

Questionnaires were sent to 183 printing managers, totaling the number of printing firms in Kuwait. A total of 148 usable questionnaires were received representing a response rate of 80 percent in the first national survey on the subject in Kuwait. The returned questionnaires showed that 60 percent of printing firms in Kuwait had adopted Computer Integrated Prepress Systems (CIPS), as opposed to 40 percent which did not adopt the technology. The adoption period constituted six years as shown in Table 8.1. In 1989, about 9 percent of the adopting group had installed CIPS, but a year later (1990), the adoption rate reached 24 percent which tripled the number of installations in 1989. In 1991, the number of CIPS installed dropped to only 5 percent due to the impact of the Iraqi invasion in the country. In 1992, after the subsequent liberation, 33 percent of the adopting group had installed CIPS. In 1994, the number of CIPS installed dropped again from 33 percent in 1992 to 16 percent in 1994.

The above results followed a similar pattern to Rogers' bell-shaped frequency curve for an adopter distribution as described in chapter five. The 9 percent of printing firms in Kuwait which adopted CIPS in 1989 are regarded as *innovators*, while the 24 percent who adopted in 1990 are regarded as *early adopters*. In 1992, 33 percent of the total adopters of CIPS are regarded as *late majority*, whereas the 16 percent of adopters in 1994 are regarded as *laggards*. Approximately 70 percent of the adopting group did recommend to their company to adopt CIPS. While the majority of printing firms in Kuwait did adopt the technology, very few

firms had successfully implemented the technology. Visits to the printing firms revealed that state-of-the-art equipment had been purchased, but machines were not integrated as a network because the printing firms lacked skillful employees to maintain the equipment.

Table 8.1
The Percentage and Years of First
Adoption of Computer Integrated Prepress Systems
(N = 90)

Years	Frequency	Percentage (%)
1989	8	9
1990	22	24
1991	4	5
1992	30	33
1993	12	13
1994	14	16
TOTAL	90	100

Factors such as quality, profit, productivity, the need to replace old systems, and market demand influenced the adoption of CIPS by managers of printing firms in Kuwait. The ‘goodness of fit’ test indicated that there was a statistically significant difference in the percent of responses as to the reasons for adopting computer prepress. Higher percentages reported improved quality, increased profit, and increased productivity than those who reported replaced old systems and new markets. Table 8.2 shows that the respondents who had installed CIPS believed that the reasons for adopting the technology were to improve quality (33 percent), increase profit (27 percent),

increase productivity (25 percent), replace old systems (11 percent), and market demand (4 percent).

Table 8.2
Reasons for Adopting Computer Integrated Prepress Systems

(N = 90)

Reasons for Adoption	Frequency	Percentage (%)
Improve Quality	30	33
Increase Profit	24	27
Increase Productivity	22	25
Replace Old Systems	10	11
New Markets	4	4
TOTAL	90	100

The need to improve quality was the most influential factor in adopting CIPS. However, it is important to note that what might be considered “quality” by printing firm managers in Kuwait does not necessarily equate to universal quality standards. In the light of personal observations, the main reason for the lack of quality is that there is a dearth of knowledge of graphic arts and graphic design in Kuwait and perhaps, the Arab world, which is apparent in the Arabic publications. During the present investigation, it was discovered that very few printing firms in Kuwait met the quality standards enforced elsewhere in the world. This discovery is ironic because the Arabic letterforms are well known for their aesthetic value, and in the past, the Arabic calligrapher always held a high position in society.

Table 8.3 revealed that there was a significant difference in the percent of responses as to the reasons for not adopting computer prepress systems. For the non-adopting group, the most influential reason for not adopting was the lack of trained personnel (50 percent), which was followed by the Arabic software incompatibility (30 percent), risk of obsolescence (10 percent), budget constraint (7 percent), and lack of adequate information (3 percent). It is interesting to find out that only 7 percent of the respondents reported budget constraint as a reason for not adopting the technology. Financial resources do not present an obstacle for an oil producing country such as Kuwait, but it has become apparent that there is a lack of formal training among staff employed in the printing industry in Kuwait and a lack of formal education at the academic level.

Table 8.3
Reasons for not Adopting Computer Integrated Prepress Systems
(N = 60)

Reasons for not Adopting	Frequency	Percentage (%)
Lack of CIPS operators	30	50
Arabic software incompatibility	18	30
Risk of obsolescence	6	10
Budget constraint	4	7
Lack of adequate information	2	3
TOTAL	60	100

It is not surprising that 30 percent did not adopt because of Arabic software incompatibility. The technology is Western, hence software developed in the West is dedicated to European languages and fails to take into consideration the Arabic language which has a totally different structure. It is the responsibility of Arabic software developers to follow up on recent advances in prepress technology and to produce compatible software. However, software piracy is so common in the Arab world that it prevents software developers from fulfilling their tasks.

The first source of information for both adopters and non-adopters of CIPS was basically trade shows in the US, Germany, and the UK, in addition to regional trade shows and exhibitions. However, 90 percent of adopters attended trade shows as opposed to 18 percent of non-adopters. Very few managers gathered information from industry trade journals, since these publications are mainly in English.

Chi square results did not indicate any statistically significant difference ($0.073 > 0.05$) in the number of employees between adopters and non-adopters groups. Table 8.4 shows that both the adopting group and non-adopting group had almost the same number of employees in the range of 51 to 70. Similarly, the adopting group and non-adopting group had almost the same percentage of employees in the range of 31 to 50. From this, it is safe to conclude that savings in staff costs were not a significant consideration in adopting or not adopting the new technology.

Table 8.4
Distribution of the Number of Employees in the Adopter and Non-Adopter Group
of Computer Integrated Prepress Systems

Adopter (N = 90)			Non-Adopter (N = 60)	
Number of Employees	Frequency	Percentage (%)	Frequency	Percentage (%)
Less than 10	0	0	0	0
10-30	6	7	8	13
31-50	42	47	24	40
51-70	22	24	22	37
Over 70	20	22	6	10
TOTAL	90	100	60	100

chi square = 7.01 p = 0.073

The chi square test indicated that there was no statistically significant difference ($0.435 > 0.05$) in the number of Kuwaiti and non-Kuwaiti employees between adopters and non-adopters of computer prepress systems. However, the overwhelming majority of employees in both the adopting and non-adopting group were non-Kuwaitis (85 percent), as opposed to Kuwaitis (15 percent) as shown in Table 8.5. This demographic composition in the printing industry in Kuwait presents a unique case in that the overwhelming majority of employees were non-Kuwaitis who had been hired on employment contracts.

Table 8.5
Distribution of Kuwaiti and Non-Kuwaiti Employees
in the Adopter and Non-Adopter Group of Computer Integrated Prepress Systems

Adopter (N = 90)			Non-Adopter (N = 60)	
Nationality	Frequency	Percentage (%)	Frequency	Percentage (%)
Kuwaitis	18	20	9	15
Non-Kuwaitis	72	80	51	85
TOTAL	90	100	60	100

chi square = 0.61 p = 0.435

This situation had created a racial mix in staff productivity. On the positive side, this allowed the media to cater to the expatriate audience in the country which comprised more than half of Kuwait's total population. On the negative side, when employees' contracts expired the printing firm was obliged to find new staff members, train them for the job, causing an interruption in the daily workflow in addition to the extra expenditures.

The location of a printing firm affected the adoption of computer prepress systems. The chi square test revealed that there was a statistically significant difference in the location between adopters and non-adopters groups. Table 8.6 shows that 60 percent of the adopting group were located in the urban area, as opposed to 37 percent of the non-adopting group. This data indicates that there is a relationship between location and adoption. Operating a printing firm in the urban area such as the Press Avenue in Kuwait City appears to give a firm more exposure to innovation or new trends in the industry than the firm in the suburban area.

Table 8.6
Summary of the Location of Adopters and Non-Adopters
of Computer Integrated Prepress Systems

Firm Location	Adopter (N = 90)		Non-Adopter (N = 60)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Urban Area	54	60	22	37
Suburban Area	36	40	36	60
Rural Area	0	0	2	3
TOTAL	90	100	60	100

chi square = 9.87 p = 0.008

The type of clients influenced the decision to adopt or not to adopt CIPS. Chi square results indicated that there was a statistically significant difference in the type of clients served between adopters and non-adopters groups. Table 8.7 shows that 42 percent of the adopting group served corporations, as opposed to non-adopting group which served 23 percent of corporations. In the Kuwaiti commercial printing industry, corporate clients accounted for the bulk of printing jobs and the non-adopting group accounted for only 23 percent of corporate clients.

Table 8.7
Clients Served by Adopters and Non-Adopters of Computer Integrated Prepress Systems

Group of Clients	Adopter (N = 90)		Non-Adopter (N = 60)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Corporations	38	42	14	23
Advertising	24	27	24	40
Government	28	31	22	37
TOTAL	90	100	60	100

chi square = 6.04 p = 0.050

The job title of the printing managers played a vital role in influencing the adoption of computer prepress systems. The chi square test revealed that there was a statistically significant difference in the job titles between adopters and non-adopters groups. Table 8.8 shows that 73 percent were ‘chairman’ and 9 percent were technical directors, as opposed to non-adopting group where 17 percent were ‘chairman’ and 63 percent were technical directors. In fact, the title of ‘chairman’ resided almost exclusively with Kuwaitis who made major equipment decision as to whether to adopt or not to adopt the new technology.

Table 8.8
Summary of Job Titles of Adopters and Non-Adopters
of Computer Integrated Prepress Systems

Job Titles	Adopter (N = 90)		Non-Adopter (N = 60)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Chairman	66	73	10	17
Plant Manager	16	18	12	20
Technical Director	8	9	38	63
TOTAL	90	100	60	100

chi square = 57.71 p = 0.000

The number of years which the adopter and non-adopter of CIPS had spent in the printing industry varied from 6 to 35 years for the adopting group and 11 to 35 years for the non-adopting group. Approximately 42 percent of the adopting managers spent generally between 6 to 10 years in the printing industry, and 9 percent spent 31 to 35 years. In the non-adopting manager group, 7 percent spent between 11 to 15 years, 43 percent spent between 26 to 30 years, and 17 percent spent between 31 to 35 years, respectively. Chi square results in Table 8.9 revealed that there was a statistically significant difference in the tenure of service between adopters and non-adopters groups. The test indicated that fewer of the more experienced managers were adopting computer prepress than would be expected and more of the less experienced mangers were adopting computer prepress than would be expected. In other words, the more experienced managers are not adopting computer prepress in the same proportion as the less experienced managers. This data indicates that the tenure of service of the printing firm managers was influential in the adoption of computer prepress systems in the printing industry on Kuwait.

Table 8.9
The Number of Years Which Printing Managers of the Adopters and Non-Adopters
of Computer Integrated Prepress Systems Have Spent in the Printing Industry

Years	Adopter (N = 90)		Non-Adopter (N = 60)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Less than 5 years	0	0	0	0
6 to 10	38	42	0	0
11 to 15	18	20	4	7
16 to 20	10	11	8	13
21 to 25	10	11	12	20
26 to 30	6	7	26	43
31 to 35	8	9	10	17
TOTAL	90	100	60	100

chi square = 56.29 p = 0.000

Table 8.10 shows that 42 percent of the adopting group were in the 26 to 30 years category, and 11 percent were in the 46 to 50 years category. In the non-adopting group, 13 percent were in the 26 to 30 years category while 37 percent were in the 46 to 50 years category. The chi square test revealed that there was a statistically significant difference in the age between adopters and non-adopters groups. This data indicates that the age distribution of managers of the adopting and non-adopting groups directly influenced the adoption of computer prepress systems in Kuwait. It is interesting to note here that both variables — tenure of service and age of managers — were strongly tied and really indicated the same conclusion. It is likely that those who have been working longer in in the printing industry in Kuwait are older, so the consequences for the measures were the same.

Table 8.10
The Age Distribution of Adopters and Non-Adopters
of Computer Integrated Prepress Systems

Age Group	Adopter (N = 90)		Non-Adopter (N = 60)	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Under 20 years	0	0	0	0
21 to 25	12	13	4	7
26 to 30	38	42	8	13
31 to 35	14	16	8	13
36 to 40	10	11	14	23
46 to 50	10	11	22	37
Over 50 years	6	7	4	7
TOTAL	90	100	60	100

chi square = 25.80 p = 0.000

Similarly, the level of education attained by the managers of the printing firms directly influenced the adoption of CIPS in the Kuwaiti printing firms. Table 8.11 shows that 38 percent of the managers in the adopting group had a college degree, whereas only 17 percent had a college degree in the non-adopting group. Chi square results indicated that there was a statistically significant difference in the education level between adopters and non-adopters groups. Rogers’ (1983) research on the comparative advantage of educated workers in implementing new technology indicated that education distribution of employment depends more strongly on the age of equipment than on the age of plant. In other words, younger groups who have installed new systems tend to have higher education than older groups who have been working longer in the printing firms and have not installed new prepress systems.

Table 8.11
Summary of The Level of Education Attained by Adopters and Non-Adopters
of Computer Integrated Prepress Systems

		Adopter (N = 90)		Non-Adopter (N = 60)	
Level of Education		Frequency	Percentage (%)	Frequency	Percentage (%)
High School		22	24	20	33
Diploma		16	18	14	23
College Degree		38	42	10	17
Post Graduate		6	7	4	7
Continuous Education		8	9	12	20
TOTAL		90	100	60	100

chi square = 12.25 p = 0.016

Findings of the Designers’ Survey Questionnaire

The responses of the 79 designers and art directors who returned their questionnaires indicate a heavy saturation of desktop computer prepress systems in Arabic magazines in Kuwait. Table 8.12 shows that the overwhelming majority (85 percent) of Arabic magazines have employed computer prepress systems in their design and production, as opposed to only 15 percent which were designed and produced using manual or traditional methods.

Not only is the use of desktop computer prepress systems in the Kuwaiti Arabic magazines pervasive today, it is also rapidly accelerating. Of the 15 percent of the publications which did not use computers in design and production, half expressed an intent to move into desktop computer prepress systems within the next 12 months.

Table 8.12
The Percentage of Computer and Non-Computer Aided Design Magazines
(N=79)

Use of Computer Prepress	Frequency	Percentage (%)
Computer aided design	67	85
Non-Computer aided design	12	15
TOTAL	79	100

The desktop computer prepress phenomenon is recent in Arabic publications in Kuwait. Of all the magazines involved in this survey which employed computer prepress, only two had been using a desktop computer prepress system for more than five years. However, nearly 40 percent had been using the technology for three to five years, and 54 percent had installed desktop computer prepress in the last one to two years (see Table 8.13).

Table 8.13
The Number of Years Which Magazines Have Used Computer Prepress
(N=67)

Year	Frequency	Percentage (%)
Less than one year	3	4
1-2	36	54
3-5	26	39
Over 5 years	2	3
TOTAL	67	100

Not only is the turn to desktop computer prepress moving quickly, but the method is receiving intensive as well as extensive use at magazines in Kuwait. Table 8.14 shows that forty percent of the respondents here reported that all of their pages were designed and produced using a desktop computer prepress system, and 45 percent produced more than half of their pages on computer.

The magazines used computers for a variety of production tasks. As one might expect, the use of computers for word processing and typesetting was high. But it is interesting to note that a significant number of these magazines used computers for page layout and prepared camera-ready copy with them. In addition various respondents noted on the survey form that they were also using their desktop computer prepress system for four-colour work, for positioning photos directly into page layouts and for generating page output directly onto film, instead of producing camera-ready copy.

Table 8.14
 Distribution of Magazine Pages Which Were Designed and Produced
 Using Computer Prepress Systems
 (N=67)

Pages	Frequency	Percentage (%)
All pages	27	40
More than half	30	45
Less than half	10	15
TOTAL	67	100

These designers and art directors were asked for information on the hardware and software they use in their systems. Many described a mix of computer systems, including Macintoshes, IBMs, and IBM compatibles. Although the Macintosh was the favourite (66 percent) IBMs and IBM compatibles had a frequency of use of about 34 percent (see Table 8.15).

Table 8.15
Type of Computer System Used for Design and Production of
Arabic Magazines in Kuwait
(N=67)

Type of Computer	Frequency	Percentage (%)
IBM	6	9
IBM Compatible	17	25
Apple Macintosh	44	66
Unix	0	0
TOTAL	67	100

These results can be compared to a study commissioned by *Arabic Electronic Publishing* magazine in 1996 which established the Macintosh as the favourite in Arabic magazine publishing and the clear choice among Arabic designers (Al Arees, 1996).

The preferred page layout software was Diwan’s ‘Al-Nashir Al-Sahafi’, an arabised version of Letraset’s ‘Design Studio’, with ‘Quark Xpress Arabic XT’ a close second. Although other Arabic page layout applications were mentioned, their use was simply not as extensive. These experiences and systems are similar to those described by the art

directors who were interviewed. All relied on Macintosh computers for their production; IBMs were used in their systems but only by the editorial staff. Copy was generated using the word processing functions of IBMs but designed and produced for pages on high-powered Macintoshes. Their favourite Arabic page layout application was ‘Al-Nashir Al-Sahafi’. Desktop computer prepress technology has advanced to the point where designers can avoid producing pasteups of pages and instead can send floppy disks, SyQuest cartridges, optical magnetic tapes, Zip and Jazz cartridges or other removable media with their final page layouts to printers.

The survey inquired about training on desktop computer prepress systems. Table 8.16 shows that only 15 percent had had any formal training, the majority of respondents got their training on the job (40 percent) which apparently is the more common experience, according to *Arabic Electronic Publishing* magazine (Al Arees, 1996).

Table 8.16
Summary of Computer Prepress Training Received by The Designers
(N=67)

Type of Training	Frequency	Percentage (%)
On the job/in-house	27	40
Dealers and vendors	20	30
Attending formal courses	10	15
Books and videos	8	12
Reading manuals	2	3
TOTAL	67	100

In the Designers' / Art Directors' Survey Questionnaire, designers and art directors were asked why they made the move into the new technology and were given these options: money savings; time savings; more flexibility; and reduced workload. Table 8.17 shows that designers and art directors ranked saving time as the primary reason for going into computer prepress (40 percent); adding more flexibility to their processes and control over the final product was the second most noted result (25 percent); Saving money was the third ranked result (20 percent); reducing workload was ranked lower as a reason for switching to computers (15 percent).

Table 8.17
Reasons for Adopting Computer Prepress in Design and Production
(N=67)

Reason for Adoption	Frequency	Percentage (%)
Saving time	27	40
More flexibility	17	25
Saving money	13	20
Reduce workload	10	15
TOTAL	67	100

These responses indicated that Arabic magazines in Kuwait went into desktop computer prepress primarily with the idea of saving time. In their written comments in the questionnaire, several respondents noted they liked the ability to see the product on screen before proofing, and the ability to handle more work. One art director said he expected all the areas listed to be affected and that he hoped his magazine would

experience the great progress this system has brought to other magazines. They found when they added desktop computer prepress systems, however, that their expectations were not realised quite as they had anticipated. The start-up investment for desktop computer prepress systems can be very costly, and since most of these respondents had only recently installed computers, there cannot have been sufficient time to justify the expense and begin to realise cost savings. In their comments respondents noted that the idea that desktop computer prepress would reduce workloads was a myth. Several pointed out that their workloads had actually increased with computers, primarily because the time saving in production opened up more time to do other tasks. Some seemed to find this a positive result, others did not.

When asked to estimate the amount of time saved by using desktop computer prepress, they responded with answers most frequently between 20 and 40 percent, with the range between 20 and 30 percent being the most popular choice (Table 8.18). The great majority responded that it had improved their operations. Some said the amount of time saving was difficult to estimate since their jobs had changed and the workload now included other tasks.

In the questionnaire designers and art directors were asked how the addition of a desktop computer prepress systems had changed their staff structure and responsibilities in designing and producing magazine pages. They were given the following options: positions have been added, positions have been eliminated, responsibilities have been reassigned, or no changes have been made. Their answers reflected a definite change.

Table 8.18
Percentage of Estimated Time Saving by Using Computer Prepress
(N=67)

Time	Frequency	Percentage (%)
Less than 10%	2	3
10	2	3
20	21	31
30	22	33
40	10	15
50	6	9
Over 50%	4	6
TOTAL	67	100

Over half of the respondents who have used computer prepress said that responsibilities on their staff had been reassigned because of the introduction of desktop computer prepress systems (52 percent). Table 8.19 shows that 30 percent, however, reported no changes at all, and 15 percent reported the elimination and the addition of positions to their staffs.

Table 8.19
Summary of Change in Staff Structure As a Result of Using Computer Prepress
(N=67)

Type of Change	Frequency	Percentage (%)
Positions added	2	3
Positions eliminated	10	15
Responsibilities reassigned	35	52
No changes	20	30
TOTAL	67	100

The impact of desktop computer prepress systems on the production process in Kuwait has been dramatic. The computer has taken over functions previously done by hand. Thus, desktop computer prepress technology has had its greatest effect on specific areas: It has eliminated retyping of copy. It has added precision and eliminated the estimation involved in fitting copy into layouts. And it can move the whole process along faster because it performs functions quickly; also because more tasks can be done in-house, time spent waiting for outside vendors is reduced or eliminated.

Summary of Findings

Analysis of the data indicated that 60 percent of the responding commercial printing firms had adopted desktop computer prepress systems, as opposed to 40 percent which did not adopt the technology. Computers were utilised on magazines in ways fitting the definition of desktop computer prepress mentioned in the literature review. Not only is the use of desktop computer prepress systems in the Kuwaiti Arabic magazines pervasive today, it is also rapidly accelerating. Those who did not use computers expressed an intention to move into desktop computer prepress systems within the next year. The need to improve technical quality, increase profit, and increase productivity were the major factors involved in adopting desktop computer prepress systems in the commercial printing firms. For the non-adopting group, the lack of trained personnel and Arabic software incompatibility were the most influential reasons for not adopting the new technology.

Lack of Quality

As noted earlier, there is a dearth of knowledge of graphic arts and graphic design in Kuwait and perhaps, the Arab world, which is apparent in the Arabic publications under study. In light of personal

observations, the reasons for lack of quality design were observed.

The Incompatibility Factor

It is not surprising that 40 percent of printing managers in Kuwait did not adopt the technology because of Arabic software incompatibility. The technology is Western, hence everything developed in the West is dedicated to the Latin language and fails to take into consideration the Arabic language which has a totally different structure. It is the responsibility of Arabic software developers to follow up on recent advances in prepress technology and to produce compatible software. However, software piracy is so common in the Arab world that it inhibits software developers from fulfilling this.

In addition to the need for peripherals capable of handling Arabic script, the computing profession requires, at almost all its levels, an additional qualification: a proficiency in the English language. This added burden restricts many who would benefit from computers if the facilities were available to them in their own language, particularly at entry levels. One can easily imagine the potential problems if computer operators, in the United Kingdom for example, had to control their machines by using Japanese commands. In many countries, the investment in linguistic training and the use of specialised input/output units have been relatively successful when the operation of computing tools have been isolated from the production environment. To meet the pressing needs of the Arab market, several companies which operate mainly in the Middle East, have developed a wide range of products for available microcomputer systems. In addition to Arabic versions of popular business-oriented applications, a number of software tools and utility programs have been provided to process Arabic data with standard input/output units for these systems.

Although all these products helped to boost popular usage, the language problem remained largely unsolved. The installation and operation of such products still required the knowledge of the English language. Furthermore, the case-by-case search for particular solutions resulted in the proliferation of different norms that often conflicted with each other and led to severe incompatibility problems. Whatever their scope, all the efforts invested to incorporate the Arabic language in computer systems have been commonly referred to as the arabisation of computer systems or in its abbreviated form the arabisation process.

Arabic Software Piracy

Unfortunately the prevalence of software piracy in the Middle East currently demotivates Arabic software developers. Unless the rights of software developers can be protected, by legislation and education, then this time of maximum opportunity for Arabic software will be dissipated through a cynical disregard for the developer's rights.

There has been little commitment by governments in Arabic countries to law enforcement regarding software piracy. In developed countries governments have been active in protecting the rights of copyright owners. It is illegal to make or distribute copies of copyright material without authorisation. No other copies may be made without specific authorisation from the copyright owner. Several raids have been conducted and deterrent penalties have been imposed. These raids against software pirates will continue, to encourage the purchase of original software.

When purchasing software, the user should make sure to buy legitimate products. Many counterfeit packaged products are designed to look similar to the original manufacturer's products but are of inferior

quality. Purchasers and users of counterfeit or copied software face unnecessary risks:

- Viruses, corrupt disks, or otherwise defective software
- Inadequate documentation
- Lack of technical product support available to registered users and
- Lack of software upgrades offered to registered users.

In addition, in purchasing software which is counterfeit or copied, the user not only denies the software developer its rightful revenue, but harms the industry as a whole. All Arabic software developers, both big and small, spend literally years developing software for public use. A portion of every dinar (Kuwaiti currency) spent in purchasing original software is funnelled back into research and development so that better and more advanced software may be produced. When purchasing counterfeit software, the money goes directly into the pockets of software pirates.

Demographic Characteristics

Since commercial printing managers of commercial printing firms in Kuwait are key elements in the adoption decision and implementation of prepress innovations, the impact of the diffusion of desktop computer prepress may be affected by managers' attitudes toward the innovation and by the way they perceive its consequences in their professional practice.

A starting point for understanding this process is to identify key individual characteristics which may be related to managers' attitudes toward desktop computer prepress. Only when these characteristics become clearly identified can the planner devise strategies for the

implementation of new prepress technologies.

Drawing upon Rogers' conceptual model for individual characteristics, this study selected and adapted variables related to innovation based on studies and operational definitions from existing research in the diffusion of innovation and technology. Utilising the environment of the Kuwaiti graphic arts industries with its unique mix of employees this exploratory study investigated selected individual variables as they related to managers' attitudes toward desktop computer prepress. This should serve as a preliminary step in the process of building a body of knowledge about the nature and traits of managers' attitudes in this particular cultural setting.

The results showed that the overwhelming majority of prepress employees in Kuwait were non-Kuwaitis. This demographic composition in the printing industry in Kuwait presents a unique case in that the overwhelming majority of employees were non-Kuwaitis who had been hired based on employment contracts.

This situation had created a racial mix in staff productivity. On the positive side, this allowed the media to cater to the expatriate audience in the country which comprised more than half of Kuwait's total population. On the negative side, when employees' contracts expired the printing firm was obliged to find new staff, train them for the job, causing an interruption in the daily work flow in addition to the extra expenditure. Visiting professionals have commented upon the emergence of a particular visual character, which presumably is the result of the mix of Arab, Filipino, Pakistani, and West Coast American influences.

The job title of the printing managers played a vital role in influencing the adoption of the technology. Ideally, the chairman of a firm makes major equipment decision as to whether to adopt technological innovation.

The tenure of service of the printing firm managers was significant and influential in the adoption of desktop computer prepress in the printing industry in Kuwait. The age distribution of managers directly influenced the adoption of the new technology. The study found that younger managers tended to be more innovative than older managers. There was a statistically significant association between the age of the respondents and their attitudes towards the new technology. Younger managers tended to be more receptive toward the adoption of desktop computer prepress than older managers.

Similarly, the level of education attained by the managers of the printing firms directly influenced the adoption of the technology. The study showed that managers with higher degrees had adopted the new technology; as opposed to managers with high school degrees who tended not to adopt the technology.

Shift in Tasks

Based on regular visits to the printing firms, the researcher noticed that a shift in tasks among employees took place. For example, many typesetters whom the researcher knew personally had taken to page layout and designing. An art director in a newspaper raised the question: Who sits at the terminal? "If a typographer, it means additional political problems for an editor trying to get newsroom control over the process. If a journalist, it means getting control at the price of assigning journalists to do what is essentially typographer's

work.” This phenomenon has created a new breed of designers and typographers who lack a proper background in graphic arts education. Many CIPS adopting managers viewed the technology as a technical concern, i.e., ‘what can the machine do for us’ rather than the social or communications implications of “what can the machine do to us.”

In general, this study supports Rogers’ description of innovators’ characteristics, which is similar to the information provided by the CIPS adopting managers of printing firms in Kuwait. Rogers (1983) indicated that innovators were usually identified by their cosmopolitanism, great influence in a social system, leadership in giving opinion, operation of large size organisations, superior communication skills, youth, higher levels of education, more efficient management systems, and employee-oriented sensitivities.

The response of prepress workers to the addition of desktop computer prepress will be discussed at greater length in the next chapter which focuses on the deeper meaning of the transformation of crafts.

Chapter 9

THE MEANING OF TECHNOLOGICAL CHANGE: PORTRAIT OF A CHANGING WORK LIFE

This chapter is an exploration of prepress workers' experiences, perceptions and responses to the previously described technological changes in the graphic arts industries. At the core of this exploration are workers' descriptions of the objective effects of recent technological change, and the way in which its specific characteristics shape their subjective experiences, perceptions and actions and thus represent a reflection on the deeper meaning of the transformation of crafts work in the Kuwaiti printing industry. At the centre of analysis is the generation of themes emerging from the rich variety and vivid descriptions presented by prepress workers about their changing work life. The problem is how to organise and analyse the major concepts or themes and the relationships between them without losing the flow and consistency characterising the uniqueness of these workers' accounts.

In order to reach an interpretive framework, which moves from the individual to the intersubjective and collective level, the easy flow and coherence characterising individual accounts will have to give way to the more limited presentation of 'telling statements' which most appropriately exemplify the underlying commonalities. The structure and analysis of emerging themes and their interrelationships are thus composed from excerpts from a variety of interviews. Going back in time, these interviews become oral histories of work, relived in the powerful accounts of the shift from work as a meaningful, playful human activity to labour determined by the operation of the machine and driven by the necessity of making a living. Given this focus, the

emphasis is on the changing world and experience of prepress workers in the Kuwaiti printing and publishing industries.

This chapter is divided into three parts. It starts with changes in production staff focusing on workers' accounts of the changes in their work activities over time. These lively descriptions surface the implications and meaning of the way, in which characteristics of new patterns of work organisation and technological equipment determine workers' subjective experience and their objective situation. The accounts of older and younger prepress workers with different specialisations, along with the experience of semi-skilled workers, are explored for common themes as well as variations. Next, changes in the work environment are explored in terms of their subjectively perceived impact on health and the physical well-being of workers along with considerations of the implications of these changes. Finally, the analysis of the changing nature of social relationships, as a concomitant outcome of the transformation of work, will be the main focus, concentrating on relationships between workers and occupational groups, as well as workers and management.

Changes in Production Staff

While technological change has affected all of the traditional occupations found in the graphic arts industries, there are differences in the extent to which new technologies have altered the work characteristics of the various occupational groups in the prepress area in Kuwait. As noted in chapter four, the introduction of computerised Arabic phototypesetting in the 1970s followed by the digitising of Arabic in the 1980s had far-reaching effects on the work of Arabic calligraphers. In addition, the introduction of computer prepress systems in the 1990s was a major breakthrough in Arabic typesetting.

As the researcher owes his informants a more encompassing representation of their 'stories', this section develops a comprehensive portrait of the working life of the people involved in the process who were willing to share their experiences. Furthermore, these accounts provide a background for illustrating how the themes of the researcher's analysis and interpretations in the next sections have emerged and are grounded in the interviews and observation data. The following accounts are based on transcribed interviews with older and younger prepress workers. These stories were told in their own words, only slightly shortened and rearranged for easier readability. The researcher has also tried to describe the context in which these interviews took place for the purpose of making the environment of his informants come alive for the reader. In order to protect their anonymity, informants' names along with the names of printing firms have been changed in this and the following sections.

From Reed to Mouse: Calligraphers

As noted in chapter four, Arabic calligraphy has been influenced by the digitisation of Arabic type. The associated areas of graphic design and typography have developed rapidly and Arabic printers have sought new ways to replace the work of the traditional calligraphers who worked in conjunction with printing and publishing.

In describing their present work, calligraphers, talk about being out of touch with their product, missing the satisfaction flowing from the sense of accomplishment and identification with the task, and the loss of the craftsman's pride that characterised the skilled calligraphers work in the past. Youssif, who is 43 years old, states:

"Calligraphy used to be a skilled occupation. I had fun, I enjoyed the craftsmanship. You were in charge of your

headlines from start to end. Now it is really boring and monotonous. Sure, you compose headlines, but in truth it is the computer that does it... you are just the one giving the commands. In the past, you had a relationship to what you were doing, to the whole page really. You could tell yourself, well, I have done this headline — but that is not the way it is anymore. If the software is acting up, people do not care very much. They watch how type get distorted and they do nothing about it. You do not really understand anymore what happens inside the computer.” (July, 1997)

Most calligraphers who were interviewed, are considered to be skilled craftsmen and had mastered years of apprenticeship to learn their trade. Early in their career, they face the obsolescence of their skills, losing their work role and with it their sense of pride and dignity. The bitterness and cynicism flowing from this experience of redundancy and loss is expressed in Moustafa’s remarks, who is a calligrapher in his mid-fifties exclaimed, followed by a cynical smile:

“This profession simply does not exist anymore, workplace changes...well, the craft is lost. Any unskilled person with a computer can do it now. Sure, you are still a skilled hand calligrapher, what does it mean? we just do not have an occupation anymore. If you are looking for a job now and they ask you — well, what have you done before — you say, I have done headlines... What do you want — they say — that is nothing, that is not what we need...” (July, 1997)

Arabic calligraphers find themselves trapped. They earn very good salaries, the salaries of skilled craftsmen in the trade which they now receive for what has basically been turned into an unskilled job. Leaving almost certainly involves a considerable cut in income; staying implies the fear of job loss, the confrontation with a sense of obsolescence, failure and resentment. Their skills have become obsolete, leading to uncertainty regarding the future. As Sadeq, another calligrapher, illustrates the dilemma:

“Knowing there is no future in this occupation, I was really worried about losing my job. During the change phase, some people left, the best ones. But what skills do I have to switch jobs? I have no choice and the money here is good. If you have a family and obligations you cannot just leave. So you have to be silent and be grateful for still having a job. What qualifications do I have, I have done calligraphy, what is that, that is nothing now, they do not need us anymore...” (July, 1997)

Kareem, 63 , has his own business working as a calligrapher for a living. With the most precise yet fluid strokes of an inked pen, he creates everything from greeting cards to company logos, award certificates, wedding invitations and similar items for clients who need something more personal than what is available from commercial printers. On the walls of his studio hang the calligraphy of his colleagues and some of his own work. He got his first job in doing calligraphic work at a small print shop in Kuwait City. He was told to start producing his work on a computer through an Arabised version of Letraset’s ‘Fontography’, a software which allows the creation of Arabic digital type. He remembers his last days before he left the job to start his studio:

“Like all of my colleagues, I just had to ‘swallow the bitter pill’ too, only for us older ones... There were some older colleagues who really did not want to do it. And my best colleagues they all left, they tried to find another job in calligraphy. They all tried to stay in calligraphy... but it caught up with all of them, as I have heard. Virtually all print shops have now changed to the new technology apart from some very small ones... it caught up with all of us, with every one of us.”

Kareem continues to say:

“At first, it was a big change, it was bothersome, yes it was... at night I dreamt about these commands. Yes, I had these dreams, these commands in my head all the time — what would I have to do if it should look like this or that... Well, I

guess that is normal when a major change occurs in your life. All right, we had good instructors over there. You could always ask them questions. They gave us these huge manuals which contained all these commands. So you had to do homework, it was like being in school again. You did your homework and then they checked to see what you know the next day.

Computers may come close, but they never really replace pen, ink, paper, and a learned hand. Machines can take a pen and write, but the quality cannot compare. Well, I have always been a calligrapher... I very much enjoyed working in calligraphy. The change really hit me. Man is a creature of habit and you cannot 'teach an old dog new tricks' — so I could not take it anymore, left the job to where I belong. Now very few people continue to value calligraphy because it preserves the human touch." (July, 1997)

It is worth mentioning here that some of the traditional Arabic calligraphy which exists today is still seen in advertising and in street shop signs. Major international companies concerned to promote their products into the fast growing Arab consumer markets commissioned Arabic calligraphers to produce Arabic versions of their logotype. Arab companies also sought to produce their own distinctive logotypes and trademarks using traditional calligraphy. Although Arabic calligraphy as a profession in the printing and publishing industries is no longer in demand, it is safe to say that it does not mean the decay of Arabic calligraphy as an art. The challenge is not to the art, but to the artist.

Losing Freedom to Codes: Typesetters

Even more so than calligraphers, typesetters feel removed from their tasks, deprived of a sense of being active participants and producers in the development of a meaningful product. They are passive recipients of a configured software which determine their work pace. They seem bored, feel degraded in doing uninspiring tasks, and, as a result of this

experience, they lose the sense of responsibility and care for the equipment, become indifferent and negligent.

In search for the quality of the traditional Arabic typesetting, the researcher visited a small print shop in Kuwait City which still used an old Linotype machine for some special typesetting jobs. The machine was tucked away in the basement of an old building. The big, black, antique-looking composition machine, placed in a separate room with dark wood-panelling and small windows barely admitting any sunlight, evoked a sense of stepping back into history. The old typesetter operating the machine contributed to this impression. White-haired, his face lined with countless wrinkles, Mohammed, in his faded blue apron seemed himself to be a relic of the past. He explained in great detail, with obvious eagerness and pleasure, how the machine worked. When the researcher told him that his project was to learn and discover what the recent technological changes meant to craftsmen like him, he shook his head and said: "Well, I am just glad I am old, I would never work with all this new stuff, I really feel sorry for these poor young people who have to do it." (July, 1997)

The accounts of the other typesetters interviewed subsequently have referred to a very different work environment and transformed by the introduction of new typesetting and printing processes. Rather than evoking the image of a print shop, the new typesetting department looks like a large office with 30-40 computer terminals set-up in rows. The uninformed observer might easily mistake the men and women hammering away on their keyboards for efficient secretaries. The atmosphere seems hectic, though there is little noise other than the frantic clicking of keys. The typesetters at work are wearing casual clothes; no aprons are needed anymore. All these changes acquire

meaning only in the context of the typesetter's perspective.

The sharp contrast characterising the past experience of the Arabic typesetter emerges from Ali, a typesetter himself who has witnessed the technological change. He looked back on his experience. His voice often trailed, as he searched for words in which to describe the change in his craft, making no effort at hiding his disappointment:

"I really liked my job, and the bottom line is that they have killed it. Sure, working with a computers now, you can cut and paste. But you certainly do not have the kind of relationship to the product you used to have before. Now you are often disappointed by the outcome. You have some image in your mind when you code a manuscript but then the printout may look very different. You might have made a tiny mistake and then a whole table turns out to be completely messed up. The problem is you just put the commands into the computer now and you do not see the outcome until much later. Well, you can correct mistakes, check on bad word divisions, but that is pretty much it. It is really different now, it is more like working in an office."
(July, 1997)

Moussa, who immigrated from Egypt fifteen years ago, very intelligent and alert to what is happening in his environment, works in a rather small printing company with 25 employees. His major task is the coordination of text preparation and layout of a series of scientific periodicals — activities which encompass considerable variety. His account, thus, reflects his own as well as the experience of his coworkers:

"The text is entered into terminals. To set margins, choose a certain type face, etc., you select specific commands... You can see the comments that you type but you cannot see what they really do. All right, you can check on typos or correct bad word-divisions, yet everything else is left to the person who does the coding. You have to rely on them for the

coding to be correct. They have to put in the right commands, the right spacing, type size and type face. You only see what happened once you get a printout.” (July, 1997)

New computer systems on the market have the capacity of actually representing various fonts, styles and type sizes, thus requiring less abstract thinking and imagination. The tangible physical interaction with the work material, however, was one of the features that made their craft attractive to printers. This, together with the flair for aesthetic composition, now rendered obsolete by the new technology, is summed up by Fareed, a very articulate typesetter, looking back on 20 years of work experience:

“I enjoyed the hands-on, tangible aspects of the craft, you could touch the type face, it was real... now completely different functions are required. They just moved us into these new jobs, though in truth we may be the wrong people to work on these terminals...” (July, 1997)

These statements indicate the loss of the potential for being creative. Traditional craftsmanship was characterised by a sense of ownership in the outcome of one's work, being involved in the creation of a meaningful, aesthetically pleasing product. The work process entailed a playful, experimental quality. It involved continuous assessment of an emerging picture, allowing for changes and creative variations as the craftsman judged the development of his creation. The craftsman's experience was that of freedom, of aesthetic pleasure, of trust and pride in his skill and judgment and in the quality of his product. He felt in control of the outcome of his work.

In contrast, the present experience seems characterised by feeling removed from the outcome of one's activity. The tasks to be performed deprive the worker of the sense of meaning and creative participation in

the work process and the results of it. The product of his efforts is often disappointing because the worker does not really understand the technological processes which determine the outcome. The earlier sense of pride and freedom turns into frustration, a sense of loss of control, an experience of powerlessness. Previously the actively participating subject in the work process, the worker now becomes the object required to adapt to the characteristics of a technology-driven process which is beyond his comprehension.

Blauner (1971) alludes to this subject versus object existence and consciousness, suggesting that a person is powerless when he/she is controlled and manipulated by other people or an impersonal system such as technology and when he/she cannot assert himself as subject to change and modify this domination.

The powerlessness experienced and described by these typesetters must be understood in the context of the specific features characterising the nature and utilisation of new typesetting technologies. Some of the factors contributing to this experience are technology inherent or machine-based. Yet the social structural context of the design, acquisition, and utilisation of new technological equipment, reflected in work organisation and processes, are of equal, if not greater importance in affecting workers' experiences. In other words, the particular structures of worker-technology interaction are not determined by the equipment itself. The emerging nature of work organisation and social interactions are shaped by the characteristics of the social relationships of production in which decisions about the choice of technological equipment, and the way in which work processes are organised, are supplied and management controlled. These decisions are imposed on workers, left with few choices to change or modify their work situation.

Three technology inherent features contributing to the experience of powerlessness can be identified. First, there is the shift from a concrete conceptual understanding of the work material and processes to the need for abstract thinking. Second, workers' output can be controlled by computer-based output statistics along with management imposed activity reports. Third, the variety of systems available in modern phototypesetting limits the transfer of skills and knowledge. The decision about whether or not to use built-in control mechanisms, the fragmentation of tasks, and the hectic pace imposed by the work flow, however, are determined by the characteristics of work organisation aimed at optimal output and productivity (Blauner, 1971).

The shift from concrete conceptual thinking to implicit abstraction implies a change in the cognitive processes required in the interaction with new typesetting technology. Typesetting in the past involved a step-by-step procedure in which the emerging product was always visible, open to manipulation and change as it evolved. It thus enabled the compositor to follow and to understand the work process as it unfolded (i.e. the typesetter would set the margins, choose a type face and size, set the type, make changes if necessary until he was satisfied with the page he had created). The new computer-based process, in contrast, requires abstract imagination of the outcome of any given command entered on the keyboard. The computer is perceived as a 'box' to be fed with commands which, with some luck, will yield an acceptable result. The process initiated by these commands cannot be followed and seems incomprehensible to the worker. The outcome thus remains uncertain and is often experienced as very frustrating.

The increased technology-related inability of the worker to follow and understand the work process he is engaged in is described by

Braverman (1974) as a general phenomenon of technological development in the context of advanced environment of production. He suggests that the increased separation of planning/design and operating functions leads to a decrease in skill, both in an absolute and in a relative sense. Not only do workers lose craft and traditional abilities without gaining new abilities adequate to compensate the loss — but the more science is incorporated in the labour process, the more sophisticated an intellectual product the machine becomes, the less control and comprehension of the machine the worker has.

A second important technology built-in feature is the capacity for output control. Output can be measured according to the number of characters typed within a given time frame as well as by recording the exact time of film print out. The freedom to set one's own work pace, a characterising feature of traditional craftsmanship, is lost. Kamal, talking about his own experience with the recording system at his workplace, vividly illustrates this point:

“The computer knows exactly how many characters you have punched. It registers everything — You cannot just say, well, I got the printout at such and such a time. It tells you precisely that it was 16.45.59, even indicating hundredth of seconds. That is when the output came out, and if you say otherwise, they tell you you are not telling the truth...”
(August, 1997)

A less obvious but just as important limitation of the freedom to set one's own work pace follows from the technical nature of tasks characterising the implementation of new prepress processes. The individual typesetter is largely dependent on the work pace imposed on him by the work operations preceding and following his particular task. Where his job before encompassed the composition of a complete page, for example, this function is now split into separate tasks accomplished

by different people. The freedom to set one's own work pace could also be a laggard's character, and it may be that the workers' disgruntlement is due to the fact they can no longer 'work the system'.

Kamal continues to say:

"If you have nothing to code, you are just waiting and you have no other choice but waiting for the next job. Meanwhile you cannot do anything... You just sit there and you are kind of forced to read the newspaper. Then suddenly your superior shows up and you think... I hope he did not notice that I was reading the paper... You have this feeling that you are doing something which you probably should not do, but you are obliged to kill the time." (August, 1997)

While this statement may create the impression that work proceeds at a leisurely pace, this could be interpreted that the work pace is now determined by the characteristics of the new production processes. Waiting times may occur when they are not desired, followed by times of work overload and stress. The hectic pace characterising the new work situation was mentioned in many interviews and is largely seen as being a direct result of technological change. It seems to bother Amir, who has been actively involved in the earlier implementation of the Arabic Monotype series 589 in his company. Talking about the changes, however, his voice becomes quieter:

"Today everything has to happen fast. The pleasant atmosphere you found in old print shops is long gone. You have to produce more because the new equipment produces more, faster, so it means that people have to work faster, too. It is inherent in the new systems — they are fast, you have to get the maximum out of them. I do not think it is good for people, they are frustrated and stressed. I notice it in myself. Somehow I have lost the peace and quiet, it has its effects — you really have to keep yourself in check. It is a war against deadlines every day." (August, 1997)

There seems a sharp contrast in the workers' accounts regarding work loads. Some workers get bored while waiting for a job to finish, and the task of one person is divided to that of many, yet others are stressed all the times because they are overworked. In the researcher's opinion this is due to the fragmentation of tasks and the division of labour as a result of the new prepress technology. It is clear that the traditional task of one prepress worker now is often divided into the following steps: i.e. coding of manuscripts (typesetters), text typing (mostly done by women), proof-reading (proof-readers), mounting (strippers) and page make up (designers). Each of these steps has its own pace and flow in the prepress process. It can be also argued that this phenomenon is typical of the attitude to a 'clean up' of obstructive and corrupt working practice, as happened in parts of the UK press.

Word Processing: All Women Club

The printing industry in Kuwait has long been an exclusively male dominated sector. This changed with the admission of women into apprenticeships in various occupational categories in this trade. Their main tasks are word processing and proof-reading.

The term semi-skilled is used here as a distinction between the relatively large number of women working in text processing and their few female colleagues holding graphic design qualifications. The new occupational category of semi-skilled, mostly female operators is a result of the shift from hot-metal composition to phototypesetting and to computer word processing. The hiring of women provided management with a pool of cheaper labour willing to accept part-time employment with flexible working hours necessary in magazine production. This is the reason one can see a predominance of women in this group in Kuwait. While these semi-skilled women come from

different educational backgrounds, the skill they all have in common is the ability for fast typing. The particular situation and responses of this group of semi-skilled women have to be understood in the context of the specific characteristics of women's position in Kuwait. These non-Kuwaiti women are the wives of the expatriates who make up the labour force in Kuwait. The value orientation of the true role of women in Kuwait is that of a mother and wife.

The researcher visited the word processing department in one printing firm located on the Press Avenue in Kuwait. This department is part of the larger typesetting and data processing unit. The work area was renovated and reorganised when the new computer equipment was introduced in 1987. During the researcher's first visit on a weekday morning, it was found that only about one third of the approximately 30 word processing terminals were occupied, mostly by women of varying age. The atmosphere was quiet and few people were whispering. The department director, while giving the researcher a tour, had also lowered his voice. There was little noise apart from the frantic clicking created by dozens of fingers hammering away on computer keyboards.

The work process is easily described. Computer operators get the manuscripts which are distributed to individuals by the supervisor. The task of these women is to first type in the codes which determine type face, size, column width, etc. They often do not realise the meaning of the different codes. All that is left then is straight typing of text, as fast and with as few mistakes as possible.

The women who the researcher had chosen to interview were allowed to join him in the department's cafeteria. Similar to the other interviews

with their male colleagues, the researcher first asked them to talk freely about their work history and how their jobs had changed over the past years.

Salwa, a Lebanese, has worked in this department for seven years and described the change in her work place as follows:

“The shift to personal computers has really been a positive change. When I first came here, they still had these teletypesetting machines. The advantage of computers is that you can see the text now. You can make changes and corrections any time. You can read through it again and that creates less stress. I also think the computer is sort of interesting...” (August, 1997)

Most of the women interviewed consider the shift to computer to be a positive change, by allowing them to see the text they type. At first glance, this would seem to lend support to the argument that technological change, though deskilling some tasks, increases the skill level of other jobs. Yet, while it is true that the shift from the earlier teletypesetting technology to computers has made these women's jobs easier, this does not reflect an upgrading of skills leading to a more satisfying work experience. Fatima is one of the few women in the department who has been working full-time for 11 years echoes many of the themes brought up by her male skilled colleagues:

“You do not have a lot of creative possibilities in arranging the text because now everything is precoded. When we get the manuscripts, you just have to enter the codes. It used to be more fun, you could be a little creative. Sometimes we can make tables, that is the most interesting part. It is really a routine, it becomes boring after a while. You also had more contacts in the past. Typesetters came over and talked to you, make a little joke. Now everybody just has their own terminal. They do not like it when we talk during work. You are really kind of isolated.” (August, 1997)

Amani, a Syrian and married with two children, used to be a secretary before she came to work in Kuwait four years ago. She seemed tired and glad for the break provided by the interview to be made with her. She pointed to some of the negative work aspects reiterated by her colleagues:

“What we do here feels like an assembly-line job. The work is really monotonous. I could not do it five days a week. I do not have headaches or back pain, but I just feel really worn out in the evenings. I have considered working as a secretary again. When I think what I am doing here, I almost feel a little ashamed, just typing all day, any ‘idiot’ can do that.”
(August, 1997)

The common themes emerging from these accounts are monotony, boredom and stress. The characteristics of work organisation, the specific technology-inherent features, and the fast work pace result in a sense of isolation. Work content and job design both provide little opportunity for a sense of accomplishment and satisfaction. The allocation of more demanding and interesting tasks to the skilled graphic designer creates a sense of frustration and feelings of being discounted. Amal, who used to work full-time, had cut back to working 20 hours a week. She summarised her own and her colleagues' resentment by saying:

“The problem and the frustration is that the men get all the interesting jobs. All right, somehow I understand it, after all they were the skilled people. There are some women here who know as much as the men. I know how to design a page, too, and sometimes when some men are on vacation, we do the same tasks. But then, when they are back, we get the same old boring jobs. What keeps me here is just the money.”
(August, 1997)

The absence of human interaction as part of their tasks, the lack of a

sense of meaning and accomplishment flowing from the monotony and lack of challenge characterising these jobs, lead these women to compare their present tasks with other jobs they held. Many of them agree with the idea of doing something else.

These statements illustrate that these women, like their male coworkers, miss the work-related human interaction and the absence of challenge. They feel that much of their potential is wasted. The skills required in their present jobs are very limited and do not allow for an intrinsically satisfying work experience. The search for meaning, self esteem, and a sense of accomplishment in work are thus not limited to skilled workers, as the perceptions and aspirations of these women indicate. The importance of the ability to use initiative, thought, and independent judgment on the job has been found to be equally relevant for men and women, as Cockburn's (1993) study on gender differences and job satisfaction suggested. While the nature of supervision was found to be one of the most central aspects for men, substantive job complexity was considered the most important factor by women.

Despite of the absence of these characteristics of job satisfaction in the work situation of semi-skilled women, the dissatisfaction with their tasks and the way in which work is organised do not lead to the strong sense of powerlessness experienced by the skilled craftsmen. This appears to be rooted in an important difference between them and their male colleagues. Most women who were interviewed, and this holds true for the skilled female designer, too, do not attribute the central importance to their work role that men do. Many of the women who work part-time only, define their major role as wives and mothers. Their sense of self-esteem and satisfaction depends less on their work experience than on their family roles.

Najwa is married, with two young children. She appreciates the flexibility of her working hours which she can organise around the needs of her family. She says:

“I can make some extra money because the working hours are great for my family. When they made the switch to computers, it was tough. The system kept getting ‘messed up’ and often the work of a whole day was lost. We got these phone calls, they asked us to come in and help out many evenings. I was upset every time the phone rang, my husband did not like it either, and I thought about quitting this job. You also have to see the positive aspects. For the time being we need my salary. My husband started his own business and every ‘dinar’ I make is invested there. That is what I focus on. When I am home and an order comes in, I get excited.” (August, 1997)

Digital Melting Pot: Typesetters, Designers and Strippers

Digital prepress has simplified the process of getting things into print, but it has not reduced the responsibilities. It has changed the roles and the expectations. As stated earlier in chapter two, digital technology has blurred the lines distinguishing the various prepress tasks. What was once the domain of highly-trained experts, now often falls squarely onto the shoulders of one person. In digital prepress many of the tasks formerly requiring seasoned professionals — typesetting, design, acquisition, colour correcting — are often performed by the same person. The designer receives text in digital form and then he/she can freely change the font, the size, the style, the position of the text on the page. In this sense, he/she can be both the typesetter and paste-up person. He/she would scan in photographs, crop them, scale them, colour correct them, and put them into position on the page. In this sense, he/she is both the image acquisition person and the stripper. The interviews with the designers in this study provide a closer look at the consequences in this shifting of responsibilities.

Traditionally the focal point of a magazine art director or designer's office is a light table. This is basically a large sheet of framed translucent glass lit softly from underneath, which is used for placing copy and images in careful alignment on a page layout. Designers in the past spent hours over their light tables, working with rulers, Isograph pens, Xacto knives, proportion wheels, layout paper, and hot wax adhesive. One of the most notable features of one designer's office is the absence of the light table and all the paraphernalia surrounding it. Instead, dominating his workspace is a computer with a large 21-inch screen. This, more than anything else, symbolises the changes in the production processes in Arabic publications in Kuwait. In Majed's operation, responsibilities have been reassigned and positions added with the implementation of a desktop computer prepress system. Majed, a young designer who has recently been hired for his computer graphics skills implies that:

"There is a lack of definition in work roles. At this magazine I am familiar with a person who held the title of 'graphics editor' also was in charge of creating prototypes for proposed new sections, scanning in and toning halftones, typesetting and tracking countless logos for use throughout the magazine, and — when time allowed — produce informational graphics. And guess what usually was last on the priority list?" (September, 1997)

As publication production technology changes with the implementation of desktop computer prepress, there are again changes occurring in the labour structure of design and production. Most the interviews with designers and art directors suggest a shift from using outside service providers — subcontracting freelancers and vendors — to performing more tasks in-house. Thus, the reassignment of tasks has meant an increase in responsibilities. Because of the desktop computer system, one efficient person can do the work of three persons. That 'efficient

person', however, may not see this increased workload as a positive situation. Taher, another young designer who put away his light table and started executing his designs on computer, has voiced some frustration at the expectation that he can now be a copy editor, proofreader, designer, and sometimes a keyliner — in effect, increasing his workload:

“Designers now must be able to do it all. Everybody’s job description is grey now. Everyone does everything. What I mean is that designers are also performing some production tasks. Designers have more responsibility for typesetting now, they must have typesetting skills which means basically that they now do what professional typesetters used to do. It is their job to make sure typeset copy looks good, that the letterspacing and kerning and typography are appropriate.” (September, 1997)

He continues to say:

“Management has to think twice before overloading one person with all these tasks. Text editors are often ill prepared to produce page layouts. Most of them went to journalism school, after all. They studied words, not visuals; facts, not creativity. Now in the real world, managers have given them the tools of typography, colour and page architecture without realising that most journalists have no formal education in these areas.” (September, 1997)

Taher saw that the addition of computers made his firm more competitive. The equipment has meant a cash savings for the company. Despite these results, He felt that the impact of the introduction of desktop computer prepress was not an improvement on his production process. Although in general workloads had been decreased, he saw his responsibilities as having been expanded:

“One thing that bothers me is the hectic work pace. When I am done at five, I cannot just shut off. You are right in the

middle of it all day. It seems to me that all this new technology is not good for people. It affects my leisure time. I am really finished in the evening. I often have to take a few hours to relax first before I can do anything else. The stress and the pace has its price, it did not use to be like this, it really affects the people." (September, 1997)

Desktop computer prepress systems have been viewed primarily as production tools. Analysis of the Managers' survey in the previous chapter noted that their purchase by magazines in Kuwait has been essentially the result of concern about management matters such as saving time and money, and those involved in the decision to purchase desktop computer prepress systems were primarily printing managers. Boulos, another designer, found that the computer did not really save him much time and effort over the traditional hand methods of doing certain tasks. He acknowledged that technology sometimes can be more trouble than it is worth:

"Sometimes there is no way to output a design produced on computer in order to see what it looks like because of technological problems. The printer is not much help in figuring out how to do it. I can get a soft proof, in a lower resolution, but that is not very satisfactory because I cannot really see how it will look. Then there is the time you spent rebuilding your system software this morning because your computer crashed. It took you two hours to figure out what piece of software was causing the problem; finally it turned out to be a corrupted copy of 'Al-Nashir' that was scrapping every application in which you tried to use it. The point is that no matter what technology you use, there will always be time wasted dealing with its quirks. The more complex the technology gets, the more likely it is to fail, and there are many in the DTP business who will argue that any time saved using modern production techniques is lost again because of inefficiencies in those same techniques. Our goals are simple: to produce work on time, under budget, and with the highest quality possible. But this is a tricky industry. It is difficult and counter intuitive. There are many steps that go wrong along the way." (September, 1997)

The greatest impact of the implementation of desktop computer prepress systems on careers and livelihoods in Kuwait is falling on people outside the magazine operation. It is affecting those outside vendors who used to supply typesetting and other services, and whose work is now being done by magazines in-house. A look at one such situation briefly will serve as an example of how the rapidly developing technology is affecting this group.

'Flying Colours' in Kuwait City is a small service bureau which is developed out of a printing company. Owner Rony realises that with the increased turn to computer prepress, the printing work which goes to him and to Kuwait City printers is drying up. His response, however, was to take a hard look at the way things are developing and figure out how he could fit in. Because the computer prepress field is still so unsettled, his service bureau has taken a diversified approach. In the autumn of 1993 he could offer clients output on a Linotronic 300 with a resolution of 2540 dots per inch; a colour laser printer; black and white laser printer, colour or black and white scanning; computer time rental; training; typesetting, and designing. In addition, he produces a newsletter updating clients on his services and on computer prepress techniques. The owner considers himself to be 'unique in town'. But his problem is not an easy one, he constantly has to make decisions about the purchase of equipment which is even more technologically advanced and more expensive than what he has, knowing that the market may change in coming months making that purchase worthless. Rony says:

"I try to stay up with the game... figure out which way to go. Right now I am holding back on computerised colour separation equipment because the technology is not settled yet. I have eleven people in my office, mostly hired from printing businesses which have been out of the competition.

These people must retool their skills in order to stay employed. They must be Mac literate or have traditional print shop skills. When I search for people with both, I either get one or the other. I tend to pull people in from the trade. Those skills are harder to develop than computer skills. As a service bureau owner, I see my role as an intermediary or liaison between the designer and the printer.” (September, 1997)

Three basic changes, therefore, as described by the designers are: The elimination of the keyboard operator position, less dependence on outside typesetting services, and a consolidation of more responsibilities in the designer’s role. A fourth change in positions and responsibilities is emerging as well, and that is the role of production manager. The production manager has always overseen the technical aspects of putting a publication together, working out problems with printers and making sure that printing deadlines are met. This position is changing to accommodate the technological needs of maintaining a complex computer system. The evolution of this position is formalised most clearly by Safawi, director of computer resources at one magazine.

Safawi is an example of a new role arising in computerised design and production systems as well as the blending of skills required to handle this position. These responsibilities straddle the fence between the purely technical side of computer hardware and software maintenance and troubleshooting, and the aesthetics of design. More than a production manager, Safawi is responsible for maintaining and upgrading the computer hardware and software. In addition he acts as liaison or even an interpreter between the designers and the computers. He explains his role as:

“Muddy lines are separating design duties from technical support. Should the designer also be the person in charge of troubleshooting Macs? I do not want the designers to limit

their thinking to what the computer can do. They should conceptualise by hand, then they come to me and I advise them how to transfer their ideas to the computer. Things that would take them hours to do by hand, can take five minutes on the computer. They do not need the computer expertise; but they depend on me." (September, 1997)

Safawi who began as a designer, is a hybrid. He brings to his position a unique blend of skills in design, typography, and computer technology — and, according to another staff member, is well paid for what he does. He essentially acts as a buffer or an interface between designer and computer, translating one to the other.

Still there is one individual who acts as the "computer guru". Walid, a recent mechanical engineering graduate of Lebanon, is responsible for keeping things running smoothly; he does routine maintenance and keeps the machines virus-free. Walid makes no hardware or software purchase decisions. He worked briefly for a computer graphics company, and became interested in design. In his present job, he is working himself into a design position while also troubleshooting the computers. His status, however, is nowhere nearly as exalted as that of Safawi. As one designer puts it, "I know the programs; Walid keeps them running right."

It is the rare person indeed who accomplishes every task from design to print. Digital prepress is a complex chain involving many different people and the designer is part of that chain. It is up to the management to understand what role each has in that chain, and how the choices it makes affect every other part of the process. Communication is of utmost importance in assuring that a project makes it into print on time and as it is envisioned.

Changes in the Work Environment

The focus of the preceding sections centered around workers' subjective interpretation of what technological change means in their experience. Reflected in these accounts is their emphasis on what might be described as the psychological effects of these changes. Little attention has yet been given to the more objective aspects of how the introduction of new technologies can affect workers' physical well-being. Many studies addressing the impact of technological change in the workplace have emphasised improvements due to the elimination or reduction of health hazards such as taxing physical work, noise, dust and so on. The printing industry is one of the settings in which the introduction of new production processes has dramatically changed the work environment. Bergsland (1997) gives the following description:

Printing used to be a messy industry filled with ink and dust and huge piles of paper scraps. Before the modern era, it used chemicals that not only stunk, but also 'ate skin'. It was filled with tremendous mechanical devices that commonly 'ate fingers', if not whole hands. There was no sense wearing decent clothing. It could get ruined in a day and often was. It was commonly said that 'printing gets into your blood', and that was literally true. The hands of a pressman could be recognised at a glance by the uninitiated — ink-stained and calloused. Back then there were no press women. The entire industry had the reputation as hard drinkers with 'girlie' calendars plastered on the walls. Printing was perceived as hard work done in 'sweatshops' by uneducated mechanics.

Digital production is an entirely new ball game. It takes place in carpeted, air-conditioned offices with windows. There are pictures on the walls. Most of the participants are educated, often college graduates. Printing is no longer a craft handed down by apprenticeship. It is a technological skill learned from books, videos, and specialised training, practiced at computer terminals and no longer bound to any

location. Even in the traditional segments of the industry, all that is left is the presses and bindery equipment. The concepts are still handed down, but the equipment is radically different.

The craftsmen who were interviewed seemed to attribute less importance to these positive changes, yet they are not neglected in the colourful accounts provided by the typesetters on this topic. Sami, though currently involved in many coordinating and editing functions, still looks back on 11 years of working as a typesetter with a nostalgic tone in his voice. He sees the change as a trade-off:

“What you miss is that you do not have the material in your hands anymore. Sure you can still cut and paste paper, but really you do not have the kind of connection with your work material that you used to have. What is really new is that it is a clean job now. I do not get dirty hands anymore from the galley proofs and the press. So it is easier of course, the way in which things works now.” (December, 1997)

While this change is mostly greeted with relief, there is this other aspect of physical work which contributed to the feeling of having a day of work accomplished. Jameel, a young platemaker in his mid-thirties, reflects on these changes:

“The new computer-to-plate technology is clean and easy. The workplace is more like a lab now, the room laid out generously, air-conditioned and all. Before it was kind of an alchemist's kitchen. What I miss is the physical aspects of my work because in the past you could see what you had done, now you do not see it anymore. I was familiar with every part of the equipment, I knew I have done my job for the day. Now if something goes wrong, we have to wait for the supplier's maintenance people to fix it. Now you only watch, you do not even know what was wrong. You feel you are just a number.” (December, 1997)

Again, the relief from the physically taxing aspects of the traditional printing process is juxtaposed with the loss of satisfaction, creativity, the freedom and pride of the craftsman, as the statements above illustrate. The price that had to be paid for these improvements in terms of the lost sense of self-esteem and accomplishment, the monotony and fragmentation of tasks seems to outweigh the gains in the experience of most workers. This is reflected in the way in which they connect their description of workplace improvements with the many aspects lost that characterised their appreciation for the traditional craft.

Apart from the heavy lifting, pressmen were exposed to high noise levels and ink-dust in the air; health hazards have been virtually eliminated in their new work environment. Operating remote control panels in a window encased room protects them from the noise and dust of the printing presses operation. But the new technology involves a trade-off between different health hazards and physically taxing aspects. The need for heavy lifting, noise, and ink-dust in the air have been replaced by more mundane hazards such as repetitive strain injury, lower back pain, neck pain, eyestrain, and the hazards of electrical shock. There has been a lot of concern about, and research into, repetitive strain injuries which occur from repeated physical movements doing damage to tendons, nerves, muscles, and other soft body tissues. The rise of computer use and flat, light-touch keyboards which permit high speed typing have resulted in an epidemic of injuries of the hands, arms, and shoulders. The thousands of repeated keystrokes and long periods of clutching and dragging with mice slowly accumulates damage to the body. This can happen even more quickly as a result of typing technique and body positions that place unnecessary stress on the tendons and nerves in the hand, wrist, arms, and even the shoulders and neck. Lack of adequate rest and breaks and

using excessive force almost guarantee trouble. All of these are serious and in advanced cases can cause great pain and permanent disability. Most of these hazards can be reduced by improved ergonomic equipment and training in safer computer operation.

It is important to mention in this context one aspect which can be easily missed, as it does not — in these workers' experiences have an immediately recognisable health effect. It is related to the effects of psychological stress experienced as a result of the new technological production processes. The present work organisation not only seems stressful to older craftsmen, but it affects the younger colleagues as well.

Stressful work situations accompanied by fatigue and inability to relax after working hours are related to cardiovascular disease, symptoms of depression, and increased mortality. While some of the long-term effects of psychological stress may not be as visible in the short run as the improvements in terms of the relief from taxing physical work. It appears that the earlier more obvious health hazards (such as back troubles, hearing problems, etc.) are being replaced by different, less visible, but possibly much more serious health effects (Essoyoufi, 1994).

Finally, the indirect relationship between workers and machines which derives from the more abstract content of work tasks using electronics- and microelectronics-based technologies, has been noted in a study by Cockburn (1990) on the 'Introduction of New Technology in the Composing Rooms of Four Newspapers'. She provides a graphic account of how the new 'cold type' computer technology transforms the composition stage of newspaper production and apparently reduces the requirement for traditional manual craft skills. A major element of

composition involves typesetting. Until the 1970s typesetting was accomplished using 'hot-metal' methods based around large Linotype machines, which were typically seven feet high and six feet across with numerous moving parts. Here compositors or 'comps' would receive type-written copy from the editorial department to be typeset:

The operator sits at a wide keyboard on which 90 keys are organised in three banks . . . each keystroke he makes releases a small brass matrix, a tiny hollow mould of a single letter of the alphabet, from the overhead magazine, the matrices slide one at a time, down the chute in response to the operator's key strokes, collecting in an assembler where they may read the line . . . The collected matrices are then 'sent away' by pressing a lever. Molten metal is forced into the faces of the characters resulting in a solid slug or 'line o' type' about one inch high, which is ejected on to a waiting tray (galley). Here, the lines, still hot to the touch, assemble, as the operator taps away, into columns of text. (Cockburn, 1990)

The replacement of 'hot metal' by computer-based methods of typesetting radically changed the experience of work for compositors:

The men . . . report a striking change in their relationship to the equipment on which they work. The Linotype was large, its parts were visible and moved . . . , the men knew the function of each component, they listened for changes in the sounds made by the machine and would respond to them . . . The new electronic keyboards however are small, smooth, encased and unrevealing . . . Most of the men had had a glimpse inside the input unit. They saw an enigma. 'There is nothing moving in the damn thing. It is all chips and solder.' Men brought up in a mechanical era, used to cars as well as Linotype feel helpless before computer technology . . . In such ways the men have moved from an active and interactive relationship to a passive and subordinate one. (Cockburn, 1990)

Changing Social Relationships

Workers and Occupational Groups

The transformation of prepress technology and work organisation has affected not only the relationship of craftworkers to their work. These changes also had a powerful impact on the characteristics of their social relationships at various levels. Interactions between workers inside and outside of the workplace have changed along with the relationships between workers and management.

The argument has been made earlier that the characteristics of changes in the mode for production — for example, the particular type of work organisation flowing from the utilisation of new technologies — reflect the underlying nature of existing social relations. These social relations are closely bound up with productive forces and in acquiring new productive forces men change their mode of production. By changing their mode of production and changing their way of earning a living, they change all their social relations. In other words, specific technological choices or changes reflect the characteristics of existing social relations and these choices in turn affect and modify existing relationships within and among the various groups involved in the production process.

The interaction between technological innovation and concomitant changes in management and market relations have been addressed in chapter five. The focus here is on the changing relationships as they are relevant in the experience of workers. The central outcome of the profound changes in their worklife — as the following accounts illustrate — is a decrease and a qualitative change in their interactions. The demise of the traditional craft community leads to the loss of occupational identity and with it the sense of commonality. The earlier

cohesiveness, the sense of belonging is destroyed as workers feel isolated and respond by withdrawing.

The introduction of new computer prepress production processes in *The Kuwait Times* is used as an example to illustrate these developments. It exemplifies a general phenomenon which is not unique to the printing industry, as the introduction of computer-based technologies often involves an increased fragmentation and routinisation of tasks followed by a decreased need for direct personal interaction.

Some background information is needed to provide a more comprehensive picture of these developments in *The Kuwait Times*. Until summer 1984, company management, newspaper editorial offices, typesetting, data processing, platemaking and the printing department were all under one roof in *The Times*'s headquarters located in the inner city. With business expanding in the early 1970s and high quality colour offset printing technology developing, construction of a new printing centre was undertaken in the early 1980s. The new printing facility, built on an industrial site at The Press Avenue in Shuwaikh, started production in the summer of 1984. The printing department, platemaking and the dispatch department were also moved to the new facility.

The relocation of these departments have caused the loss of daily interactions between these workers and their old colleagues at headquarters. One might argue that locational shifts and business expansion are changes workers always had to deal with when adopting a new technology given the specific features of the new production process of work organisation. The loss of contact with both the immediate work product and the work process as a whole, is

accompanied by a shift from person-to-person interaction to primarily person-machine contact.

Abdul Rahman, 42, is not a skilled platemaker but started to work in this department in the late 1970s when platemakers were hard to find. His tasks and pay, he says, are no different now from those of his skilled coworkers. Having been with the company for 15 years, he sounds regretful as he describes the changes in relationships:

“We do not have any direct communication with our colleagues anymore. Before we moved here, we were right in the middle of the action, located between the dispatch and the printing department. We would run into each other, exchange a few words. Here we have lost contact, we are much more isolated. We are basically just in this room now — Since we rotate jobs, at least we get to spend a week over in the reprography department every few weeks. That is when we get to see some of our old friends — but that just does not happen too often...” (December, 1997)

This feeling of being cut-off and isolated characterises the almost identical statements made by Abdul Rahman's coworkers. Pressmen voice similar dissatisfaction as Marwan, a young pressman, complains with a glare on his face:

“The department is isolated. You do not see anything, you feel sort of locked in — the windows here are in the supervisor's office, we just look out on the machines. It is like a factory, cold and unfriendly. Downtown in the old location you could look out the windows and see the people in the street, you were right in the middle of city life. The platemakers were on one side, the dispatch department on the other. Now you do not have these contacts anymore, it is a pity.” (December, 1997)

The common theme running through all these accounts is a sense of

being 'locked-in' and isolated in one's department and tasks. The variety of contacts, the opportunity for exchange is increasingly lost. This image conveyed by the researcher's informants are rather strange since they are all working at close proximity. Both locations have a cafeteria where interactions between departments would still be possible. While the new production processes have a direct influence on decreasing the necessity and potential for direct interaction, the researcher's observations still seem to contrast with the above accounts. The loss of relationships, the feeling of isolation might have their deeper roots in the elimination of the earlier spontaneously occurring informal communication as an integrated part of the ritual of work.

Workers and Management

New technology and the resulting changes in work organisation have not only affected the ways in which individual workers and the various occupational groups relate to each other. The shift from traditional craft to the present computer controlled production processes has at the same time altered the relations between workers and management objectively as well as subjectively.

These changes have to be interpreted on the background of the traditional organisation of craft production. Traditional consultational and cooperative super-ordinate and subordinate interactions, based on the valued expertise of a skilled workforce are changed as work becomes fragmented, characterised by anonymity, output controls, and production pressures.

Thus, this changing quality and structure of authority relations is vividly described by older craftsmen. Their earlier experience of feeling appreciated and respected as human beings and skillful craftsmen by

their super-ordinates gives way to being treated as anonymous "commodities" in the production process. Workers are shifted around or disposed of in accordance with management defined requirements of the changing production processes. Fouad who just turned fifty, has been with the same company for 17 years. His account of the retraining process and his discomfort with the new technology indicate his worries about the future of his job. First, he hesitates and seems to struggle for the right words before he talks about this topic which obviously bothers him:

"Well, it has a lot to do with the new management. The previous director — he was down on the shop floor now and again and he saw how hard people worked. He knew many of us personally. If he were still in charge and somebody would say, well, Fouad is going to be fired, he might step in and say — no, no, he worked hard in those past years. But the new management, they do not know the people anymore, and we never see them. Well, he is fired." (December, 1997)

Salman, another older typesetter is known among his coworkers for not keeping quiet if something bothered him. He recounts a series of conflictual incidents he had with management, and then concludes:

"You are pretty helpless today. Management cultivates so-called perfectionism, they can do everything but they have forgotten what it means to be human. At the newspaper where I worked before that element was still there. There was still a relationship between the director and us. A relationship which at times was threatened to be disrupted, but you could always talk things over again. That has completely disappeared today. There was just this human element, it might not even have had much to do with the personality of this particular director, he was not very easy to get along with but he was just there and you could talk things over." (December, 1997)

Some of these developments described are seen as refuted to the growth in companies' size. Beyond that, however, older craftsmen interpret these relationship changes as based on management's drive for business expansion, increased productivity and profitability, resulting in an inhuman fast paced work process. Hassan has witnessed the development of his company over time. He was actively involved in the planning and introduction of monotype in his firm. He tells about many evenings when they tried to work the bugs out and the boss was there, discussing the problems with them. His memories reflect the stark contrast between past and present:

“When I first started here, this was a family business. There was the old boss, and then his son. I knew the old man well, he came to visit us even after we moved out to this new production facility. Well it really used to be different with the old man, he cared for the workers, that was the philosophy of this company. But then came a new guy, with him the growth ideology. All these other newspapers and magazines were added. Expansion is the key word, this crazy growth ideology which will blow up on us some day... The pleasant atmosphere characterising the old print shop is gone. If a machine has a certain capacity, it has to be utilised. The new technology produces more, so people have to produce more, work faster. There are pressing deadlines all the time. Every company feels it has to expand, produce more. I think it has been bad for people, there are a lot of frustrated folks around here, partly because there is so much stress.” (December, 1997)

Hassan's description of the traditional 'family-like' print firm, where the owner in many ways played the role and was perceived as a kind of a father figure, is a phenomenon which can still be observed in the small print firm. The transformation of the printing business driven to expansion by a growth ideology and the utilisation of new production processes destroyed the mutual trust and cooperative spirit of the past. It is replaced by distrust and a sense of utter powerlessness in which

workers find themselves at the mercy of processes and developments which are beyond their control. The new production processes and their impact seem to parallel the types of management perceived as necessary to organise the output of machines, rather than the work of people. The workers experience both.

The metaphorical image created by these workers accounts is the reversal of means and ends; where traditional technology used to be a tool in the craftsman's hand, the introduction of new production processes relegates the worker to become the tool, controlled by the machine. The 'wholeness' of work, characterising traditional craftsmanship, encompasses creativity, aesthetic pleasure, the element of play, and an understanding of the total work process. It involves the worker as a conscious and active participant in the creation of a product which acquires meaning as it is developed according to the worker's judgment of quality and utility. The subjective experience flowing from this role is that of pride in knowledge and skills, a sense of self-esteem, accomplishment, freedom, and control.

The interviews show that workers' attitudes toward computers affect their perceptions of the application of computerised technology in relation to work satisfaction. Negative worker attitudes tend to predominate among general and semi-skilled workers who lack knowledge and prior experience with computer technologies. A positive attitude toward computerised technology is often evident among owners and at the managerial or administrative levels of business when the new technology has been adopted. However, the prediction of workers' work satisfaction as an expression of attitudes toward computers is not so evident.

In summary, workers' subjective experiences reflect what has been done to them objectively. The introduction of new production processes with concomitant changes in work organisation and training has destroyed the consciousness — activity relationship, and in so doing, turned work into labour, reducing workers to objects of manipulation and control. The changing social relationships simultaneously reflect the new mode of production which shifts traditional person-to-person interaction to person-machine contact, and replaces earlier cooperative worker management interactions with systems of supervision and control aimed at organising the output of machines rather than the productive work of people.

It is obvious that a strong indication of the negative effects of computer integrated prepress methods on staff morale comes through from these interviews, particularly with those who originally worked using more traditional methods. Those who have only worked using the new technologies, who are under-represented in this survey, may not have the same concerns. This report is, however, valid in representing the views of traditional workers whose modes of work have been most affected.

Not only the introduction of new production processes has affected the people involved in the process, but also has impacted the product itself. Essentially the experimental portion of the study which is the focus of the next chapter asks the question: Is there a detectable change in the visual appearance (defined here as design and layout) of Arabic publications as a result of the new prepress technology?

Chapter 10

TECHNOLOGY'S IMPACT ON ARABIC DESIGN

Does the use of a computer in the design and production of Arabic publications have a visible effect on that publication's design? This is the essential question addressed in this chapter. The designers interviewed in this study say that they think there is a 'computerised design look'. They cannot clearly define it, but it is something they try to avoid. Therefore, the next step in this study is to examine a sample of Arabic publications produced on a desktop computer prepress system to provide some experimental evidence on whether or not there is a 'computerised design look' detectable in Arabic magazines in Kuwait. The analysis is based on the Arabic Design Instrument developed in chapter seven. Thus, this chapter is divided into three parts. First, a brief description of the various factors which affect magazine design will be given to provide a context for a consideration of how computers may affect magazine page layout and design. Also noted are the concerns of designers from the early years of computer desktop publishing about the effect of computers on graphic design. Second, a descriptive analysis of the magazines under study is provided focusing on their external appearance as a result of using computer based design systems. Finally, the discussion section attempts to shed light on the factors which influence Arabic designers to rely on the present-day digital technology in their page layout and design.

Magazine Page Layout and Design

The role of a magazine's art director is to set a visual style or personality for the publication and to make sure that personality remains consistent throughout each issue and from issue to issue.

Typically, an art director oversees a staff of designers and production artists; the designers create layouts for the various articles and the production artists carry out the design instructions, making sure text and artwork all fit in the space available. In smaller magazines, one person may fill all these roles. The designer's responsibility in a magazine is to create a visual presentation for an article. In doing this, the designer determines how much and where type is arranged on the page, and how and where artwork, colour, and graphic elements (lines, boxes, screen, etc.) are positioned. The way the designer carries out these design decisions is conditioned by several factors:

- First, the layout for a story must be appropriate for the story itself; it must suit its style and tone and significance in the context of that issue of the publication. Designers always read articles, or at least synopses of them, before building a layout.
- Second, a designer must always be aware of the nature of the publication's readers, their demographics, their interests, even to some degree their aesthetics.
- Third, the layout must reflect the overall style of the publication and be consistent with particular aspects of the format; examples might be the use of specific typefaces or an attitude toward white space.
- Fourth, the layout is designed to get the attention of potential readers, to pull them into the page and then into the text. This is critical for newsstand magazines which must present themselves boldly at possible buyers.
- Fifth, the layout must serve readers, it must guide them through the pages of the article, showing them how to navigate through artwork displays and through multiple pages of copy or to continuations in internal pages of the magazine. Other factors include a consciousness of style trends in print media, and what the designer feels himself or herself capable of executing technically.
- And last, the layout must conform to the space availability in the magazine; tight pages might mean restricted space for an article and therefore less artwork, smaller headlines and reduced white space.

Computer-assisted design has been added into the mix of all these factors as yet another consideration in how pages are designed, but not without some concern on the part of designers. As stated earlier, the availability of sophisticated desktop publishing systems provides novices and experts alike with the ability to prepare a variety of desktop publications. However, there exists some skepticism by some graphic designers and researchers about the aesthetics of some of the graphic designs produced.

Graphic Design as a Discipline

Western researchers studied the essence of graphic design and the way graphic designers solve problems, organise space, and imbue their work with those visual and symbolic qualities which enable it to convey visual and verbal information with expression and clarity. Most researchers agree that graphic design is a hybrid discipline. Diverse elements, including signs, symbols, words, and pictures, are collected and assembled into a total message. The dual nature of these graphic elements as both communicative sign and visual form provides endless fascination and potential for invention and combination. Although all the visual arts share properties of either two or three dimensional space, graphic space has a special character born from its communicative function.

Perhaps the most important thing that graphic design does is give communications resonance, a richness of tone that heightens the expressive power of the page. It transcends the dry conveyance of information, intensifies the message, and enriches the audience's experience. Resonance helps the designer realise clear public goals: to instruct, to delight, and to motivate. (Carter & Meggs, 1993)

Most designers speak of their activities as a problem-solving process because designers seek solutions to public communications problems.

Approaches to problem solving vary, based on the problem at hand and the working methods of the designer. At a time when Western nations are evolving from industrial to information cultures, a comprehensive understanding of the communicative forms and graphic design becomes increasingly critical. The conceptual nature of the graphic design process generates public confusion about the designer's task. The designer combines graphic materials — words, pictures, and other graphic elements — to construct a visual communications 'gestalt'. This German word does not have a direct English translation, means a "configuration or structure with properties not derivable from the sum of its individual parts." (Meggs, 1992).

The designer combines visual signs, symbols, and images into a visual-verbal 'gestalt' which the audience can understand. The graphic designer is simultaneously a message maker and form builder. This complex task involves forming an intricate communications message while building a cohesive composition which gains order and clarity from the relationships between the elements.

According to Meggs (1992), there have been numerous attempts to characterise artistic creation as a set of rules. In the Renaissance, artists had formalised rules for projective geometry and ideal proportion. The rules of the Golden Section remain the cornerstone to layout in architectural, engineering and graphic design, although not always explicitly prescribed. Few graphic designers report their rules of graphic design and fewer of layout design specifically. The work of Robert Bringhurst (1997) in *The Elements of Typographic Style* is an enduring example in providing typographic rules and laws. But, some graphic designers will argue that there are no rules of graphic design such as Carter et al (1993).

The paradox is that these authors also assert that graphic design is a creative discipline which relies on breaking of prevailing rules and conventions of graphic design. Nevertheless it is evident that graphic designers have intuitively simplified their task and have made it more consistent by introducing written rules (in terms of house style and type specification, etc.) for the preparation of certain repetitious procedures. The observable uniformity of the configuration of the layout of the pages of books and magazine pages, for example, show that the structure of the layout and the size and situation of its components have been prescribed for routine distribution.

Many Tools: One Box

Originally simpler tasks such as page layout were taken over by the person with multiple skills to exploit the multi-task functional nature of the technology. This is merely the reorientation of historical roles, as compositors would hand-set type for pages using a set of rules for typography. Without this understanding the nature of digital design cannot progress as a true democratic process. In their *Digital Design with Quark XPress*, Honeywill & Lockhart (1997) maintain that the main benefit of using a page layout program is an improvement in productivity due to the availability of typesetting and layout facilities. They report a rule-based system which embedded certain principles for desktop design:

- 1. Initial briefing**
 - *Produce roughs*
 - *Choose type faces; interactive on screen selection.*
- 2. Input text to word-processor files.**
- 3. Proof text onto printer and correct.**
- 4. Commission imagery e.g., photographs and illustrations (these can be digitally produced).**
- 5. Obtain prints and digital artwork.**
 - *Digitise into computer using a video image digitiser or flatbed scanner, scale, crop to size, retouch, manipulate colour balance, etc.*
- 6. Prepare graphic layout grid using a page-makeup program.**
- 7. Electronically paste-up complete pages.**
 - *Place typesetting.*
 - *Add tints, specifying Pantone or process colours if required.*
 - *Add required line rules, boxes; line artwork.*
 - *Check results on high-resolution monochrome or colour monitor.*
 - *Add full-colour images last (use monochrome versions of the colour image as a working guide for speed of processing.*
- 8. Output to laser printer or colour PostScript printer for hard copy.**
- 9. Prepare prepress materials.**
 - *Prepare colour separations.*
 - *Output via imagesetter.*
 - *Identify transparencies to be electronically separated*
- 10. Prepare specification.**
 - *Inks, paper and order printed proofs from printer.*
- 11. Check printer's proofs for imposition, colour balance and registration.**
- 12. Order print run.**

As mentioned before, desktop technology has combined many tasks — the designer can edit the text, and the editor can now design the page — one person would make many mistakes. There is greater opportunity for skills to be diluted and there are many skills within the process. A publication is physical, being produced by many people. Each will view the publication differently — the words, the design, printing, binding, and so on. The technology allows the temptation to make the maintenance of any ongoing publication the domain of the computer user who understands the page layout program. Yet the instigation of any design or modification undertaken in these programs should be the jurisdiction of the person who understands design and its terminology. They can reflect objectively, and make informed decisions applying knowledge of the nature of design before computers.

People who require printing regularly, such as a publisher, will have agreements with paper suppliers, reprographic houses and book printers. They will work within set specifications making each supplier compatible with the other. This in turn affects how many pages can be printed together (imposition) before folding into a section, and so on. Paper, film, plate and press allow for final checks on the end product. Technology streamlines these processes as the computer can output directly to plate, or digital press, shifting further responsibility to the desktop.

Human perception tends to change gradually through exposure to new ideas, especially how one can perceive the layout of the page within advanced consumer cultures. Before computers were in regular use, the different parts of the publishing route tended to be defined by what people did. The workflow would involve the design including the copy-fit/cast-off (calculating how many pages ordinary text would cover

when changed into a typeface) to be correct before any marked-up copy (the ordinary text with typographic style instructions) was sent for typesetting. The returned galley (continuous typeset text) would be physically cut and pasted as artwork.

As both typesetter and designer were separate people, terminology had to be exact. Columns were mostly drawn-up with regular measurements because of the problems of knowing where the text would finish. Artwork surfaces would be hand drawn to include all non-printing grid structures (guidelines) reproduced in blue. Type was then cut and pasted into position. The final artwork would allow for a further detailing which separated out DTP from traditional working methods. All elements (text and image) of the design were stored in a 'job bag'. The designer should create the digital equivalent for all of the working files. The desktop becomes a metaphor for the drawing board complete with a full set of tools. Text is edited within a word processing program and images are manipulated and sized within an imaging program. The format of the publication and the page extent will have been decided before these elements are imported into the program. Now the on-screen design becomes artwork and remains fluid.

Digital Design

There has been a debate over the impact that digital design was having on young designers' ability to apply the essentials of design. Was facility on the computer resulting in a lot of 'junk' design, or was the computer freeing designers from repetitive tasks and allowing them more time to address issues of visual thinking? Holtzschue (1997) observes that this debate has also surfaced on the academic level. It began as a conversation between two graphic design educators, who found themselves teaching identical courses on design fundamentals:

one using the computer, the other using traditional media. One thought that computer design was an oxymoron, while the other was tolerant of a foggy who had not even been to cyberspace. What started as fiercely opposite positions became a mutual education. But it ended as a shared conclusion: “the computer is a natural step in design history. There is no difference between what designers needed to know about design fundamentals and what a student today needs to know. Only the medium is new. Computerised design is not a new form of life, it is just a new activity.”

There are kernels of truth to both arguments. Without agreeing on what is good or bad design, it is still easy to agree that there are too many ‘ugly’ documents out there, with too many fonts, low quality clip art, poor scans, and absolutely no sense of balance or white space. The ability to produce a printed piece does not necessarily bring with it the ability to create an attractive one. It is also true, however, that desktop publishing has encouraged many people — who never would have otherwise — to try their hands at creating something of their own on paper. Sometimes the results are marvellous. Other times the results are purely utilitarian — they get the job done, and that is all they need to do.

It was once a popular notion that computer graphics should be ‘invisible’; that is that artwork produced on the computer should, ideally, leave no tell-tale trace of the particulars that used to be associated with the medium such as highly pixelated images, polygonals, ‘jaggies’, shading, etc.

Binder (1995) wrote an article for the *Journal of Graphic Design* in which she raised the question of whether graphic designers would be thrown

into the area of obsolete professions by the new computer technology and came up with these observations:

...there are those who will tell you that they can always spot a design created using a computer, just as there are people who say they can tell writing done on a word processing from that composed on a typewriter or with a pen. The computer makes writers — and designers — too facile, they say, too quick to accept the first idea that comes off the top of their heads and to tweak it just a bit. Such work does not show forethought and planning, and it does not hang together.

Although promotional materials claimed that with computerised design systems, anyone could handle design. Designers noted that computers offered many options, but did not tell the operator what to do with them. They believed the role of designers would be as important as before, but would change as computer technology radically altered the design process. New jobs would be created, but others would vanish. Already young designers were more open to using the computer as a conceptual tool because so many alternatives could be generated so quickly on the screen. And tasks too complex to do by hand could easily be performed by a computer. Binder (1995) concluded that the new high-tech culture would have critical educational and informational needs which require thoughtful graphic design. Instead of worrying about the future, she said, designers had better start gearing up for it.

You have heard it before, whether it is coming from a 'technophobe' who hates computers or from a designer who honestly thinks that they are unnecessary: A true artist doesn't need DTP tools; those tools only encourage non-artists to pretend that they are artists. The results are a world cluttered with bad design and diluted impact for good design. The perceived value of good design goes down, and with it that of good designers. (Binder, 1995)

So what is there to complain about? Desktop publishing costs less, saves time, and puts the power of the press into the hands of more people. These are good things, but the problem is that these three advantages of desktop publishing are really potential advantages, and potential is not everything. That is why the 'For Dummies' series of books is so popular. Are the designs that keep sliding out of those millions of laser printers any good? Are they really necessary? Are they really freeing us to spend our time and money elsewhere? May be not?

It is true that the potential for that sort of design is increased by the use of computer. Once again, however, potential is just that. Desktop publishing is a set of tools, and tools are not inherently good or bad. It all depends on what you do with them. Computers cannot create good design — and good designers cannot be held back by computers.

The following answer comes right back: That is an elitist point of view: the technologies that have developed during the last decade have allowed all of us to explore our capabilities more fully than ever before. Who is to say that a non-artist cannot produce good art — and who is to say what is good and bad design? (Binder, 1995)

Justice (1993) noted that computers in the graphic design workplace are becoming ubiquitous. The problem is that many organisations implement advanced technologies without giving enough consideration to the impact such changes will have on work processes and the individuals doing the work. Being fully acquainted with all the features and functions of a piece of software is no substitute for solid training and skills in graphic arts.

There is a new generation gap, and it is between those who know the traditional methods of publishing and those who do not want to know them, who say that it is time to throw away the rule book and start fresh. But there are reasons for not using 46 fonts on one page, say the traditionalists. We have better reasons to go ahead and do it anyway, say the new guard. Fortunately, there is a middle ground: a group that says the rules should be learned and followed before

they are broken, and that sometimes the old way is the right way. (Justice, 1993)

Computers can be used to do more than simply record or manipulate a design. Baker (1993) explains how innovations in software and hardware allow computers to become 'thinking' partners in the design process. Shape grammar algorithms can be exploited to generate formal options. Other programs suggest solutions to complex, multivariable problems, and actually learn from users as the computer, over several generations of answers, evolves increasingly sophisticated responses to a particular design challenge. Computerised systems integrated both the judgmental and mechanical skills of designers. Computers had the potential for altering the work process with the objective of going beyond a mimicking of past media, to develop ways to exploit the computer's unique capabilities.

On the other hand, Owens (1993) addressed the idea that with the removal of traditional hand skills, layout would be speeded up. The result, however, might be the lack of a 'gestation period' for design. He also questioned whether the computer's limits might begin to function as value limits for the user who lacks visual training. Managers generally assume that high-tech hardware and software will play increasingly dominant roles in design. He pushes this assumption in the other direction, demonstrating how computer analyses can be essential elements in the framing of design problems. He calls his methodology 'Structured Planning' and shows how, especially in complex situations with multiple constituencies, it can greatly enrich the critical concept-generating stage of product development. His conclusion argued for the professionalism of the person with well-developed visual sensitivities who would have the understanding and confidence to challenge such 'value limits' set by the computer as design tool.

Arabic Magazine Sample Selection

As stated in chapter seven, the purpose of the Arabic design analysis instrument was to identify desktop computer prepress characteristics in the design of Arabic magazines. It was designed to determine which characteristics appeared with greater frequency and whether those characteristics tended to be more subtle and not easily detected by the untrained eye, or whether they were easily noticed. Computerised design has taken on negative connotations among some designers perhaps chiefly because of its use by amateurs in design and typography. Therefore, part of the examination of these magazines employing computer assisted design involved observations of their design appeal. In this analysis, no attempt is made to judge a design to be 'good' or 'bad', but the instrument is sufficient to diagnose a design as being computer-designed.

The magazines studied were drawn from a comprehensive official list provided by the Ministry of Information in April 1995. Included in the study were magazines from three of the four primary categories of Arabic magazines. These consist of consumer publications, trade or association publications, corporate publications and small literary and scholarly journals. Of the four, the last — small literary or scholarly publications — was not included essentially because the focus here was on commercial publications which lay a greater emphasis on design and appearance, and have greater frequency of publication. The more ephemeral products of computerised design — newsletters, bulletins, brochures, etc. — were also excluded from this research, as the interest of this study was specifically geared to Arabic magazines designed by specialists trained in layout techniques, and have a professional perspective on design questions.

Consumer magazines are sold by subscription and, at least to some extent, on newsstands in retail shopping areas; they focus on topics of general or special interest and carry advertising of interest to the target audience. Trade or association magazines are circulated almost exclusively by subscription, to individuals who are members of certain occupational, professional or vocational groups. They carry advertising of special interest to the readership. Corporate magazines are produced by companies or institutions to spread information and goodwill about the organisation. They are generally circulated free, to an audience with particular interest in the welfare of the company or institution, or its products. In their editorial focus on the company or institution, they are in essence totally advertising publications.

It was important to include in this study, representatives of different magazine categories and circulation sizes, as computer prepress usage may vary across these and other variables; the cost and complexities of investing in a computer system may result in different responses among different categories of magazines. It was not the purpose of this study to determine this variance, but its possibility is acknowledged.

Thus, twelve Arabic magazines employing computer assisted design were selected. Their selection was based on the generally accepted division of magazines into the categories discussed above. The ones used here were again, the consumer magazines, trade and association magazines, and corporate public relations magazines. The following magazines were analysed in this project:

1. Consumer Magazines

- *Al Hadath (The Event)*
- *Aswaq (Markets)*
- *Al-Farhat (Joy)*
- *Taht al Eshreen (Under 20)*

2. Trade Magazines

- *Al Rabitah (The Union)*
- *Al-Senaie (The Industrialist)*
- *Al-Kuwaiti (The Kuwaiti)*
- *Al Mizan (Justice)*

3. Corporate PR Magazines

- *Al Awqaf (Public Foundation)*
- *Ibtisamah (Smile)*
- *Al Watani (National Bank)*
- *Marhaba (Hello)*

Content Analysis

In any form of content analysis there is counting. Here, counting involves the number of times a feature associated with computer assisted design is present. Carney (1972) makes a convenient summary of the kinds of counting that usually go on into content analysis:

The very simplest kind of counting involves a mere check to see whether something is there or not. The next simplest is: Is there a lot or a little of this 'something'? Then comes: Here's a yardstick—in comparison with it, is our 'something' high, medium or low? This yardstick could well be an 'ideal type', either the logically deduced model of what ideally ought to be, or the descriptive type which represents a composite general picture.

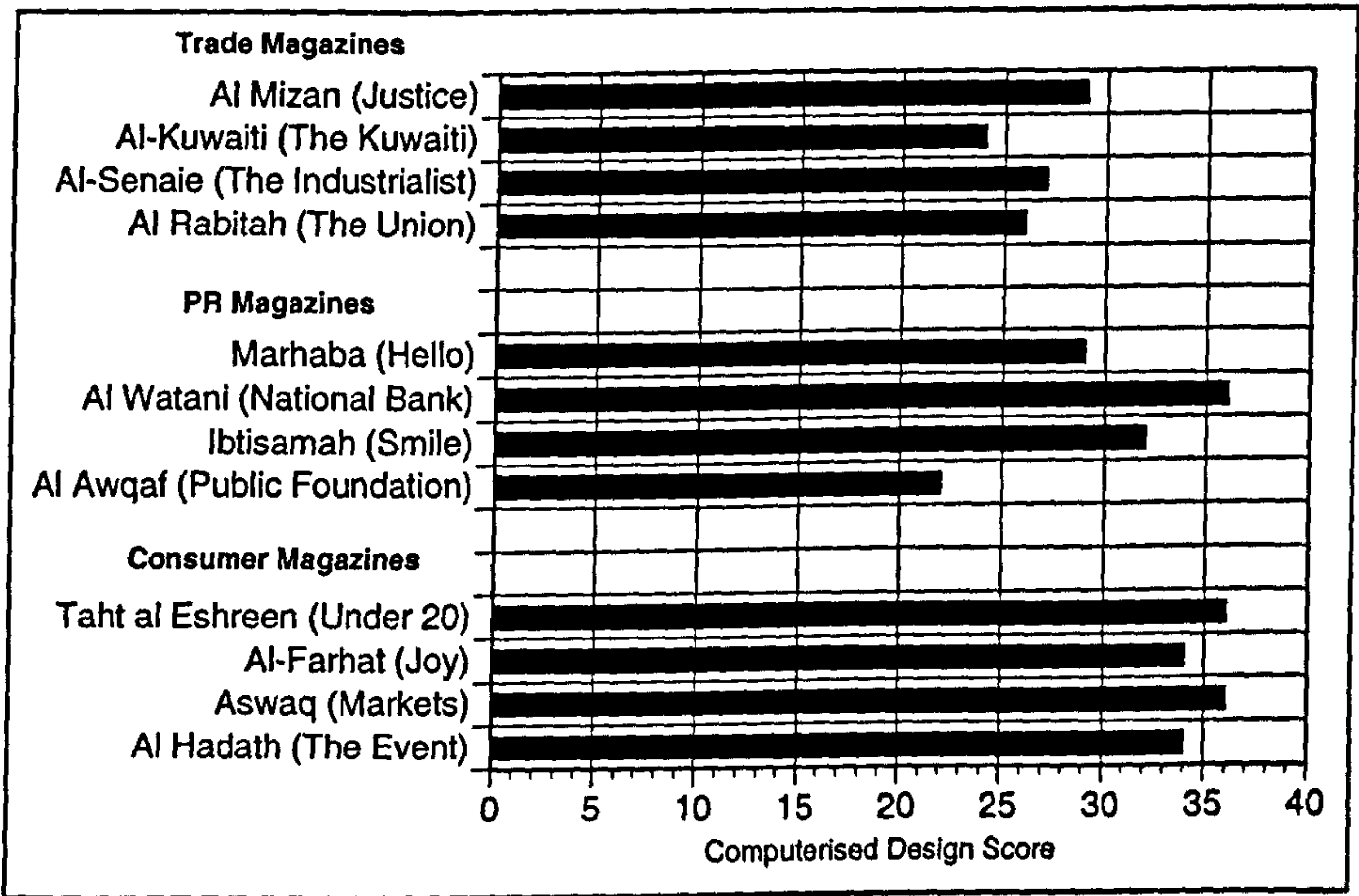
As noted in chapter seven, the instrument (Figure 7.24, p. 247) was divided into three areas — typography, use of graphic devices, and overall design approach. Each area includes a list of features associated with computer assisted design by the panel of experts and in the researcher’s observations. Each feature is scored “1” if it is present and “0” if it is not. The highest possible score is 40. No magazine scored that high; in fact, high scores are clustered between 22 and 36, the highest score. Table 10.1 concisely sets out the results. The second column, ‘Computerised Design Score’, refers to how magazines are rated on the design analysis instrument in terms of their desktop computer prepress characteristics.

Table 10.1
Computerised Design Magazines Ratings

Consumer Magazines	Computerised Design Score
Al Hadath (The Event)	34
Aswaq (Markets)	36
Al-Farhat (Joy)	34
Taht al Eshreen (Under 20)	36
Trade Magazines	
Al Rabitah (The Union)	26
Al-Senaie (The Industrialist)	27
Al-Kuwaiti (The Kuwaiti)	24
Al Mizan (Justice)	29
Corporate PR Magazines	
Al Awqaf (Public Foundation)	22
Ibtisamah (Smile)	32
Al Watani (National Bank)	36
Marhaba (Hello)	29

Overall, the magazines examined tend to show obvious characteristics associated with desktop computer prepress, and thus are easily identified as such. But a breakdown of these magazines by groups shows a major inconsistency in desktop computer prepress identification. Trade and public relations magazines tend to show fewer characteristics associated with computer assisted design, but consumer magazines tend to show more of those characteristics (Figure 10.1).

Figure 10.1
Distribution of Computerised Design Magazines



The analysis indicates that magazines employing desktop computer prepress systems are easy to identify by their visual appearance. In fact a trained eye could easily tell the difference in computer assisted designed and traditionally produced magazines. Moreover, an average reader would tell the difference only (a) if the computer prepress system is handled amateurishly, or (b) if the publication is designed to take extensive advantage of the various techniques offered by the computer. The following Arabic page layout samples (Figures 10.2 to 10.6) illustrate those characteristics.

Figure 10.2
Al Awqaf (Public Foundation)



It is easy to identify the many computerised design features in the above page: Graduated colour fill for the background, rotation on a path, 3D and dropped shadow effects for the text, use of clip arts in the bottom, rainbow colour effect for the frame, and texture filled pattern in the text box, etc.

Figure 10.3
Ibtisama (Smile)



The most noticeable computerised design features for the above magazine cover is the manipulation of images which have been added to the base image. Moreover, graduated colour, 3D effect and dropped shadow have been applied to the text.

Figure 10.4
Al Farhat (Joy)



In the above page layout one can easily notice the irregular grid column with its graduated colour fill. Also the graduated colour fill in the the three oval shaped text blocks, in addition to the dropped shadows and the use of arrows.

Figure 10.5
Al Hadath (The Event)



The most obvious computerised design characteristics in the above layout is the use of the 'page curl' plug in filter in Adobe Photoshop. Also, noticeable are the texture filled page, the embossed and dropped shadow headline on top.

Figure 10.6
Al Rabtah (The Union)



In the above page layout, one can easily notice the circle wrapped text which has been placed on the background photograph of the clouds. Also noticeable is the 3D effect text. All testimony of computerised design characteristics.

Discussion of Design-Related Results

The worst of computer assisted design shows little knowledge of or a sensitivity to the nuances of good design. In the panel of experts' view and the researcher's own observations, computer assisted design often seems applied to the surface — as though it has been slapped on top of the layout — as opposed to design which is arising from the structure of the text. Devices such as screens, boxes, shadows, geometric shapes and dotted column rules seem added in a superficial way to dress up a page. The page appears to be designed, not as a whole, but in parts — a box here, a shadow there. In fact so much attention is given to visual tricks and devices, that the design often is fragmented among several mini-focal points. The computer's capabilities seem to encourage the designer to experiment with irregular grids and elaborate initial letters as design embellishments rather than conceptualising the overall layout. This is ironic because Arabic letterforms have been well known for their aesthetic value. In the past, the Arabic calligrapher held a high position in society.

In effect, there are two possible design-related consequences when a magazine is moved to a computer prepress system:

— The layout includes features identified by designers as typical of a computer prepress system which has been poorly handled. Generally, this suggests not only an inability to handle the computer and its design capabilities skilfully, but a lack of design training as well. Therefore, the person designing such a publication tends to rely on what the computer offers for layout embellishments.

— Alternatively, the layout reflects the designer's fascination with what the computer can accomplish. The magazine evidently bears the mark

of computer prepress because the designer is willing to take the computer through its paces, experimenting with the tricks and techniques possible with the system. But it is not clearly done with a sense of design; the designer does not know what he/she is doing, but rather is pushing the system's capabilities.

Certain design identification characteristics of desktop computer prepress can arise from one or both of these two circumstances. The above samples of magazine layouts show a heavy use of screens, shadowed boxes, vertical dotted column rules, irregular column grid formats, graduated fills of colour in screens, 3D type effects — the use of all of these may reflect a lack of experience with design. A novice designer may be tempted by the computer's capabilities to rely on such features for 'design interest' instead of shaping the layout as a whole. In other words, the designer is tempted to push the computer's capabilities to add these touches; because the computer can do it, the designer will try it.

It is imperative to know that designers with a solid background in design fundamentals strive to produce a magazine with few or no signs of computer prepress. It is the work of a designer, well-trained in design and in working with the computer, whose goal is to avoid the 'computerised design look,' who puts together the publication to look as traditionally produced as possible. When there are slips, it is because the designer — or the production artist producing the layout — lacks some skill in handling the computer.

Disdain for a 'computerised design look' is a reason frequently offered for magazines handling their design very carefully when moving to a computer prepress system, but other factors can come into play and

should be noted. Magazines generally try to avoid making design changes that would be obvious to readers. The reason for this involves an assumption that readers depend on and favour consistency in the publications they read regularly. A design change can sometimes alienate readers. Also, the design of a magazine becomes a part of its personality and its identity, factors which are critical intangibles; therefore, much care is taken in changes in the visual appearance of magazines to minimise the effects of any change in production technology.

Although desktop computer prepress systems have been accepted into production at magazines, there is more reluctance to use them effectively in Arabic design. The designers in this study were not aware about the impact of the computer on the quality of their design work. It is essential to note that production is a mechanical activity and the computer brings to it an ease in achieving precision which is extremely helpful. But design is an intuitive and idiosyncratic activity, and art directors are hired for their design sense; that is their currency in the world of magazines. They are wary about the computer's role in design because of a concern about the standardisation implicit in a 'computerised-design look,' the computer's power to shape a design, if only by its mechanical limits.

The creative potential of the computer is only beginning to be realised. The challenge of digital design is not to find ways to perform new technical tricks, it is to create a new imagery that reflects the new medium. The generation of artists and designers who meet this challenge will do so in a surprisingly traditional way. Digital design requires only those things that good design has always demanded: skill in use of the medium, a mastery of foundation design concepts, and

innovative thinking. Only the writer writes; only the artist draws. The language of design, and design itself, has always been influenced by the technology that allows us to communicate our ideas. The methods used to chisel letters in stone and cast individual letters from lead have altered the perception of what design should or can be through the available technology of that time. Using a computer is no different, it creates new opportunities of how we can express our communication, and in doing so alter the perception of what Arabic graphic design now is. Before we begin to exploit the nature of digital design we need to analyse the conventions which have been established. Some of these conventions continue to be adopted and reapplied in the West to meet the needs of new technologies. So before one can make the most of digital design, one has to know the basic rules.

The results of the research support the thesis and exemplify the findings of other scholars. Essentially, when microelectronic technology is introduced into an area, there is a 'cultural lag' between the advanced technology and users' ability to handle it. Digital technology has created the immediate availability of visual tricks for Arabic publication design allowing expressive freedom for some and confusion for others. Expressive freedom can only be obtained by knowing which factors influence the design, instead of merely knowing what to apply. How far can we go before our use of the technology available to us becomes counter-productive. The possibilities are vast. But regrettably, this typographical horn of plenty contains some questionable fruit. This phenomenon is definitely having a negative impact on the readability and legibility of Arabic. We (Arabs) are the only people who must understand in order to read, whereas the other people of the earth read in order to understand. For Arabic designers, the possibilities of using

computing to present information in new ways are realised. The computer can be used not only to create visual forms, but also to enhance structural order in the content of printed communications.

The acceptance of these perceptions thus obscures the contradictions created by the dehumanising transformation of production processes as noted in the previous chapter. It prevents the development of alternative strategies which critically question the nature of technology development and implementation and the search for ways in which technology might be utilised to expand the human potential. These emerging contradictions and their implications for developing alternative visions and strategies will be addressed in the following, final chapter.

Chapter 11

IMPLICATIONS, CONTRADICTIONS AND RECOMMENDATIONS

The aim of this final chapter is to put together the broader image by linking the developments described in the previous chapters. Rather than presenting another extensive summary, the major outcomes of the technological change process described will be highlighted with an emphasis on the problematic, broader social implications and the contradictions created by these developments. This chapter will conclude with a set of recommendations based on the researcher's personal opinion as to an ideal development of the computer integrated prepress industry in Kuwait.

The goal of this research was to explore the impact of technological change on the processes involved in prepress operations in the printing and publishing industries in Kuwait. An attempt was made to show the link between technological changes in the production process and the concomitant demise of a traditional craft with profound implications for prepress workers, printing managers, and the graphic arts industry itself. The real contribution of this study lies in its focus on the largely neglected adoption of innovations and the impact of technological change on work as a central human activity.

Implications of this Research

First and foremost, this study has illustrated that the meaning of work cannot be captured by reductionist analyses of single aspects of work organisation, tasks, physical requirements, work environment and social relationships. Rather, depending on the particular way in which

these aspects interact with each other, work can be a meaningful, creative, and satisfying activity or a frustrating and alienating routine, centered around its instrumentality for the provision of basic material needs.

This thesis has thus become an inquiry on the transformation of work into labour. Craftsmanship of the past encompassed the attributes of work, involving the workers in the role of the producer in as much as his/her activity was guided by aesthetic, creative consideration, a sense of freedom and an understanding of the total work process which created a sense of ownership and identification with the product. The individual contribution constituted a meaningful part of the whole, requiring cooperation and mutual consultation. Concomitantly, the nature of the social relationships among workers reflected a sense of cohesion, community, and belonging. By contrast, new production processes involving different structures of work organisation resulted in monotonous, fragmented tasks which disconnect the individual from his/her fellow workers and from an understanding of the work process as a whole. The quest for aesthetic quality, independent judgment and creative problem solving is replaced by a hectic workplace beyond the individual's influence, built-in output controls, and dependence on limited skills focused on the operation of a specific technical system.

Deskilling and dehumanisation of work turns into humiliation in the retraining experience. The focus on learning, understanding and problem-solving, inherent in traditional craft education, is shifted to the high pressured acquisition of a set of limited skills, disconnected from a deeper understanding of the work process. In contrast to the learning of a craft, guided by notions of quality, flexibility and creativity which implant a sense of pride and mastery, and foster workers' solidarity,

retraining becomes an isolating experience, where workers have to struggle individually to acquire the new skills needed. Overwhelmed by time pressures and lacking a deeper understanding of the new systems, uncertainties and mistakes result in feelings of inadequacy, self-blame and a sense of failure.

Relationships between workers and managers reflect the aspects of moving from an interactive exchange of knowledge and consultation to one-sided authoritarian interactions in which true power relationships are obscured by managerial hierarchies where the exchange relationship between worker and employer is reduced to the exchange of the worker's labour for material compensation.

The shift from meaningful work to meaningless labour, rules by necessity and by the features and operation of the equipment, transforms the worker's role from being a 'producer' to that of being a consumer, presumably compensated for the loss of meaning by the capacity to consume in his/her leisure time. Income and other benefits, though emphasised as a way of mitigating against the frustrating work reality, are poor substitutes for the loss of meaning, satisfaction and pride, as the resentment and powerlessness expressed indicate. The powerlessness experienced at the subjective individual and collective level has its objective equivalent in the loss of the value of craftworkers' traditional 'labour-power', characterised by the possession of skills which were in high demand and thus increased their freedom to move and change jobs. The obsolescence of these previously highly saleable skills, along with the changing tasks which require new, systems-specific functions, make workers increasingly dependent on their current jobs and employers.

In summary, the analysis presented in this study contradicts the belief that the widespread adoption of new production processes is coincidental with continuous advances in scientific knowledge which provide the basis for the development of new technologies. Instead, the more in-depth exploration of these change dynamics suggests that the profound transformation of the forces of production through the large scale acquisition and implementation of new typesetting and printing technologies reflects the characteristics of the underlying social relationships of production. It has been illustrated that the technological change is not simply the result of advancement in science and management's desire to substitute management control for worker knowledge. The results of the study suggest that worker knowledge is crucial in all organisations, and that management explicitly recognises this for organisations where demand fluctuates markedly or where technology is changing rapidly. This process was mediated by an often neglected aspect of the social context, namely the appealing prospect of decreasing employers' dependence on a well-paid and highly organised workforce. The major problems which arise from the analysis are: What is the nature of management's strategy with respect to the work place; and if that strategy is a deskilling one, how successful has management been.

In the introduction of this thesis, it was suggested that one needs to analyse what has been lost, and why, in order to determine what has to be reclaimed. The bleak picture painted above thus will be complemented by a discussion of the contradictions inherent in the processes described and the areas in which the characteristics of technological change may open up new potentials to be explored, if the balance of power is to be shifted, and if human concerns are to be at the centre of future developments.

Contradictions

If technological change, as has been illustrated here, is a social, and not a given predetermined process, it is potentially amenable to change and influence by a variety of actors and interests. While the way in which work is organised is largely a result of the particular features of new technological production systems, their particular characteristics are not a fixed given, but reflect designers', manufacturers', and buyers' assumptions about the optimal organisation of production processes. Although, as has been shown, the adoption of computer integrated prepress systems reflects management's desire to decrease reliance and dependence on the skills, experience and concomitant influence of the traditional craftworker, management's desire to run modern printing production with 'unskilled' and (implicitly assumed) more docile, cheaper, and non-organised workers, has not been fully realised. As the managers who were interviewed readily admitted, expert skills, though they may be different, will still be needed, and in many ways will be more important than before.

Much of the recent literature on workplace changes and automation has pointed to the fallacy of managerial hopes for complete control over the work process as an outcome of the recent technological advances. Though many jobs have been eliminated in the wake of the introduction of increasingly automated production processes, the high capital investments involved in the acquisition of such systems, their imperfections and concomitant vulnerability, have increased management's dependence on workers in a qualitatively different way. Evidence for this argument has been documented for a wide variety of changing industrial production processes.

Richmond (1990) argues, based on an in depth analysis of the features

of cybernetic technology (guided by principles of integration where controls regulate the boundaries between parts of the production process, and flexibility in machine systems which respond to changing conditions), that these machines make the workers' capacity to learn, to adapt, and to regulate the evolving controls central to the system's developmental potential. Using a variety of examples, Richmond (1990) shows how operators' poor diagnosis of problems based on analytic rather than synthetic reasoning, prevent adequate response to the emerging problems or potential disasters. Three modes of knowing are required to deal with this technology effectively: dense perception of physical processes. heuristic knowledge of production relationships, and a theoretical understanding of the production process. If these modes are not integrated, habit dominates operator response, workers feel bored under normal conditions and overloaded under stressful conditions, or the former can lead to the latter.

Richmond (1990), then, concludes that post industrial work has two stages: the worker becomes more aware of the work environment, but also begins to reflect self-consciously on his/her own actions and becomes aware of how he/she learns and develops. The worker learns who he/she is when he/she changes. Along the same lines, McLoughlin (1992) suggests that the utilisation of computer-based information technology depends uniquely on the worker's quality of minds. People need 'intellectual' skills — abstract thinking, inductive reasoning, and theoretical apprehension. These requirements, McLoughlin suggests, entail the challenge for workers and managers to design learning experiences which minimise risk, encourage imagination, and allow for play. The implications for training, McLoughlin points out, call for the development of a pedagogy of meaning which is not a single course or a series of training events, but

rather involves a reconceptualisation of the work place as a learning environment, whose success depends on the quality of social interactions and attitudes of workers and managers.

Training and the structure of work organisation, as they have been described in this study, run counter to all these principles. Typical training courses as workers have pointed out, are limited to the mastery of narrow skills without the capacity for creative problem-solving, as the underlying system's processes are not understood. McLoughlin's description of the outcome of a situation where the different modes of knowing are not integrated was confirmed by the researcher's observations of the new desktop computer prepress. While the systems were running smoothly, pressmen were bored and paid only scant attention to the controls; when production broke down, there was a considerable amount of confusion. Diagnosis of problems was sometimes successful and sometimes not. None of the workers seemed very concerned about these problems. Incapable of competently solving them, they tended to wait for somebody to come and fix them.

Management, as the interviews indicated, is not oblivious to these problems. Yet, workers frustration and attitudes of carelessness are not seen as a direct outcome of the prevailing structures of work organisation and inadequate training. Planners and purchasing managers tended to limit their consideration for workers to ergonomic concerns, aimed at reducing some of the more obvious detrimental aspects of worker-machine interaction. Persisting problems with new equipment, the recognition of workers' frustration and lack of interest, were not explored by managers as to their underlying reasons and resolution potentials. While almost all managers and supervisors interviewed acknowledged that the loss of different aspects of craftwork as an outcome of new production processes presented a

problem for many workers, they tended to blame the workers for being ungrateful. They, in turn, were frustrated that workers did not appreciate the ergonomic investments made and the positive changes in the work environment.

As workers perceive their problem-solving skills and suggestions for improvements considered irrelevant by management, they withdraw from identification with work tasks, resulting in an attitude of passivity and carelessness. It takes little imagination to predict the detrimental outcome of these attitudes on the production process, as errors and problems occur due to negligence or lack of attention. Though even in such an uncondusive environment to learning, workers often initiate their own strategies for finding ways to improve production outcomes. Focused on the need for control and self-esteem, such strategies are uncoordinated, receive no recognition, or may even have to be hidden, and in no way optimise workers' potential for diagnosis and problem-solving.

This waste of human potential is even harder to understand on the high educational level of printing managers compared to workers in many other industries. Their literacy level, and their past experience in problem-solving and independent decision-making, provides them with resources, which, tapped into appropriately, might be utilised to make work for them again an interesting, challenging, and rewarding experience. Needless to say, such an approach would benefit companies just as much. A stressful work situation, characterised by boredom, uncertainty, and lack of control, furthermore, not only has high psychological costs but is related to negative effects on physical health, absenteeism, drug abuse and so forth.

To this end, the Kuwaiti graphic arts industries do not have to 'reinvent the wheel', but look across the borders for inspiring options and alternatives to be pursued. Management policies involving a focus on quality of work along with worker involvement in the design and implementation of new production processes have been much further developed in other European countries. Experimental, participatory research projects involving workers' and management in the evaluation of new technologies and the development of quality of worklife based criteria for implementing such technologies are growing in numbers. Concepts and guidelines for worker participation in organisational change based on action-research projects have been developed.

The challenge of the large scale social implications of the recent and ongoing changes in production processes has created conditions in which workers throughout industries and across national borders increasingly confront the same problems, and, as has been noted, they are not without power. Yet, while new technologies contain the potential for qualitatively improving some jobs, McLoughlin (1992) points out, that they also entail the real threat of a newly divided society polarised into rationalisation winners and rationalisation losers, workers employed and unemployed. The trend to a further division of labour into groups of highly skilled and well-paid workers contrasted with a large number of low-skill, underpaid jobs perpetuate social inequalities in the workplace, as the losers will once again be women and foreign workers in Kuwait.

Yet, as long as the connections between economic/industrial policies and political processes remain obscured, the broader problems facing third world societies are not addressed. The contradictions inherent in new computer-based technologies and the potential they offer for new

forms of work organisation, characterised by participatory learning styles and interactive, challenging work activities, leave the question of how work will be distributed in the future unanswered. The long range impact of the ongoing drive toward further automation is tied to the image of growing population segments being continually unemployed. Finally, the implications of utilising finite natural resources to replace human energy links the question of the domination of humans to that of the careless exploitation of the natural environment.

The magnitude of these issues defy any simple solutions. They also directly contradict the deeply-rooted assumption that technological change is a form of social progress. In the face of social dislocation, structural unemployment, worker deskilling and job degradation, the burden of proof needs to be shifted to those who promote and foster this ideology. Returning to the reality of the Kuwaiti context, the integration of industrial with political democracy faces an uphill battle. The absence of legislative provisions for worker participation and co-determination in the workplace is largely a result of the ideology, that the regulation of production processes is to be left to management/ government (Ministry of Labour & Social Affairs) negotiations.

Recommendations

Concluding chapters usually end with suggestions for additional research. Some of these issues require further exploration and have been raised in earlier chapters. Thus, in line with the concern which motivated this study, the researcher concludes with a set of recommendations for possible short and long-term worker/ management strategies, as they emerge from the findings of this research.

Short-Term Strategies

The first task in the short run is to refocus the issues, to create new visions and concepts of relevance as a basis for creating interest in and structures for participation. For this purpose, existing structures and resources can be utilised to introduce new perspectives focused on the quality of work. Following are some suggestions as to what might be done:

Monthly National Publication

An article series about the social and psychological impact of new production processes ought to address workers' experiences, perceptions and interpretations around these changes. The content might address the situation of different occupational groups, work-activities, work environments, retraining, and social relationships, pointing to differences as well as to the underlying commonalities which characterise the situation of different groups. This might be based on material as it is presented in this study, combined with other available information from surveys and other studies done on this subject. Readers might be asked for feedback and comments on this information. Simultaneously, other articles should focus on alternative projects and creative strategies in the planning and implementation of technological change as they have emerged in other countries. The purpose of this information is to counteract the new feeling of powerlessness and fatalism by showing workers that there are alternative ways to address these issues and that the specific features of technological equipment and work organisation are not a fixed given but can be subject to modification and change.

Retraining

Based on the findings of this study, it seems that there exists a need for additional structured retraining among the employees of this industry in Kuwait. This need has been evidenced through the evaluation of the data obtained through questionnaires and was further manifested in the visits, interviews, and the field test carried out by the researcher.

Data obtained from the questionnaires revealed that the majority of prepress employees in Kuwait have learned their trade by apprenticeship without ever having undertaken formal studies in the graphic arts field. These employees learned through observation and direct contact with other more skilful workers. This lack of academic preparation or formal training was found to be a major barrier to employees' promotions for better positions within their firms.

Managers pointed out that the lack of available educational programs in the graphic arts field hindered this development. This research reveals that a significant number of workers are deskilled by the use of computers. Moreover, task fragmentation resulted in feelings of dependence and powerlessness experienced by some workers. As a result, several problems of production worker motivation arise.

Management must create new job programs, such as training, education, and development in response to these problems. It seems that unless in-service training programs are provided, the professional betterment of the members of the graphic arts industry in Kuwait will not be accomplished so readily.

It is imperative to remember that one key to the success of desktop prepress in Western countries is founded on professional expertise in the field of graphic arts. In the United Kingdom, for example, training is conducted in art and design colleges. But in Kuwait, where financial

resources do not present an obstacle, it is essential that the government establish an art and design college with well prepared courses in visual communication theories and graphic arts practices.

Educational Leave

Management might offer technical seminars, visits of industry exhibitions, and basic courses. These programs might be expanded by offering more process-oriented workshops which actively involve participants in reflecting on their work situation and the stress experienced, thus initiating the development of ideas and strategies for how these problems might be addressed. Workshops could be conducted in coordination with local educational institutions such as Kuwait University and private companies. The purpose is to achieve the highest possible employee participation in the graphic arts. Employees should be allowed to participate in these workshops, or short courses of their preference, providing, of course, that measures are taken to avoid decreases in productivity. Employees should not feel uneasy about taking these courses during work time. They should be encouraged to participate in these activities to the fullest.

Conferences on Quality of Work

The management might organise local conferences on quality of work, combining presentations of local and foreign experts on this issue with workshops encouraging participants to share their experiences and ideas for improvements. Such conferences might encourage the creation of local task forces which could work on the identification of attributes central to satisfying work activities and a good work environment. Emerging proposals for how work should be organised could provide the basis for short-term suggestions to management and for long range contract demands focused on quality of work life aspects.

Joint Committees

The government represented by the Ministry of Labour & Social Affairs and the Employer Association maintain a series of joint committees. The most important ones in terms of the issues discussed here are the technical committee, the curriculum/training committee and the educational leave committee. The technical committee addresses issues of new technologies and economic development in the industry. It has a consulting function and submits proposals to the decision-making bodies on both sides. The curriculum/training committee develops guidelines for apprentice curricula and continuing education courses. The educational leave committee determines which activities and courses qualify as educational leave programs.

In general, management will have to play a new, educational role vis-a-vis the employers. It has to point to the detrimental aspects of current characteristics of work organisation and job design which create a highly stressful environment with short as well as long range negative implications for workers' physical and psychological health. The workers' argument has to be focused but not limited to the human concerns involved. It can point to the social and economic costs of workers' ill health and absenteeism, and the negative impact of workers' attitudes of carelessness on the production process. Moreover, current training programs focused on narrow skills must be criticised for the stress they create and their inadequacy in preparing workers to effectively operate complex computer-based technologies.

Long-Term Strategies

Long range goals have to focus on the integration of worker involvement and quality of work life aspects in the industry-wide management/employers contract. Beyond measures which protect

skilled work, facilitate retraining, and address short-term health and ergonomic aspects, the focus has to be on new forms of work organisation and learning. The development of work structures will have to be reorganised in order to allow for workers' input in how jobs are designed, how learning and problem-solving skills can be optimally utilised, and how training should be structured. Thus, enabling workers to fully comprehend the work process. Criteria through research and development will have to be developed which describe the objectives of this process.

Research and Development

As this study indicated, little attention has been given to research in the area of printing and publishing in Kuwait. Given the valuable roles of research, printing firms in Kuwait must undertake their own research. It is essential to employ scientific research methods to measure and obtain profiles of clients. This kind of research determines how the new technology is best used for successful implementation. There are multiple functions of technology research: (1) It provides a clear picture of the usage pattern in the industry; identifies and categorises the clients and (2) assesses effects on opinions, attitudes, values, and behaviour and examines the response of commercial printing managers.

Government authorities should reach out and strive to help the employees of the graphic arts industry. Using their human and physical resources, government authorities may help implement evening courses in public schools and institutions for the benefit of those employees who cannot study during the day. Government grants and financial aid should be available for those employees' continuing education in order to help prepare more and better trained technicians in this important industrial sector of Kuwait's economy.

Distributors and suppliers of graphic arts materials and equipment in Kuwait should be encouraged to take an active part in the implementation of in-service training programs. These companies could play a catalytic part in the development of the skills and methods needed to operate the new equipment and understand the latest technological processes in the use of an ever expanding line of products.

It has to be emphasised that the above recommendations do not mention co-determination and worker involvement in decisions about the acquisition of new technologies. Long-range strategies, therefore, have to address the broader political, legislative realm. Without the passage of government legislation which stipulates workers' participation in economic and technological decision-making processes, the printing managers will be unlikely to achieve this goal for their employees. A major task therefore will be to support joint efforts by the Ministry of Labour & Social Affairs in this direction. The management's effort to get their members interested in these issues by encouraging workers' involvement and quality of work life concepts. If the printing managers succeed in starting to play a leading role in advocating new models of learning and concepts of quality in work life they may become a pioneer in the Kuwaiti labour movement.

Existing programs, such as job rotation, have proven only palliative for most employees. Employers need to understand which elements of work environment affect worker satisfaction and how they affect employees, and they may then more effectively provide an appropriate work environment, both physically and psychologically, in order to assist the worker to achieve maximum work satisfaction.

Workers' satisfaction in relation to specific factors in their work with this new technology is not clear because studies which focus on the specific equipment and tasks such as prepress are non-existent in Kuwait. Moreover, no one has linked the variables (work satisfaction and specific factors of work environment) in an effort to predict employees' work satisfaction in the graphic arts industries in Kuwait.

Broader managerial strategies are thus needed in the long-run which link questions of structural unemployment and technological change to broader policies around economic and social development. The connection between industrial policies and the disadvantaged position of social groups such as women, the elderly, foreign workers, and so forth have to be made explicit. There are no simple solutions to be offered in this respect. It is obvious that the printing managers in Kuwait cannot accomplish this task alone. They have to join with other progressive governmental forces represented by the Ministry of Labour & Social Affairs in the attempt to reformulate the management's agenda and to influence industrial policy aimed at maintaining competitiveness without sacrificing human concerns. The goal must not be a human-centered technology, but a human-centered society.

The researcher's hope is that the above recommendations offer a contribution to the advancement of the graphic arts field in Kuwait. The treatment of the topic is far from exhaustive. Many conditions and attitudes need to be improved before a really meaningful impact in the graphic arts industry will be felt. Change will not be immediate, but hopefully in time professional betterment will be available to all members of the graphic arts industry in Kuwait.

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Appendix A

MANAGERS' SURVEY QUESTIONNAIRE



For purposes of this questionnaire, "computer prepress" means the computerisation of many of the prepress operations (such as typesetting, page layout, production of camera-ready copy) involved in publication production.

Please answer all questions by ticking the most appropriate box or completing the blanks.

1. Do you use computer prepress systems in your firm?

☐ Yes

☐ No

If your response is NO, skip questions 2 and 3

If your response is YES, skip questions 4 and 5

2. What year did your firm first install computer prepress systems?

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3. Please rank order the reasons for adopting computer prepress systems?

☐ Increase profit

☐ Improve quality

☐ Increase productivity

☐ Replace old systems

☐ Reduce labour cost

☐ New market demand

☐ Other...(specify)

4. Why didn't your firm install computer prepress systems?

☐ Budget constraint

☐ Arabic software incompatibility

☐ Lack of CIPS operators

☐ Lack of adequate information

☐ Risk of obsolescence

☐ Other...(specify)

5. Are there plans to install computer prepress systems in your firm?
- ☐ Yes
 - ☐ No
6. How did you first hear about computer prepress systems?
- ☐ Periodicals and journals
 - ☐ Trade shows and seminars
 - ☐ Professional meetings
 - ☐ Sales representative
 - ☐ Other...(specify)
7. Which is the number of employees in your firm?
- ☐ Less than 10 employees
 - ☐ 10 to 30
 - ☐ 31 to 50
 - ☐ 51 to 70
 - ☐ Over 70 employees
8. What is the percentage of Kuwaiti employees in your firm?
- ☐ less than 10%
 - ☐ 10 to 20%
 - ☐ 21 to 40%
 - ☐ 41 to 60%
 - ☐ 61 to 80%
 - ☐ Over 80%
9. Where is your firm located?
- ☐ Kuwait City
 - ☐ Other...(specify)
10. Does your firm maintain a research and development effort?
- ☐ Research and development facility
 - ☐ Rely on consultants
 - ☐ None

11. Which particular group of clients is your firm directed most?
- ☐ Advertising
 - ☐ Corporations
 - ☐ Government
 - ☐ Other...(specify)
12. Which of the following most closely describes your job responsibility.
- ☐ Chairman
 - ☐ Plant manager
 - ☐ Technical director
 - ☐ Other...(specify)
13. Approximately how many years have you worked in the printing industry?
- ☐ Less than 5 years
 - ☐ 6 to 10 years
 - ☐ 11 to 15
 - ☐ 16 to 20
 - ☐ 21 to 25
 - ☐ 26 to 30
 - ☐ 31 to 35
 - ☐ Over 35 years
14. What is your age?
- ☐ Under 20 years of age
 - ☐ 21 to 25 years
 - ☐ 26 to 30
 - ☐ 31 to 35
 - ☐ 36 to 40
 - ☐ 46 to 50
 - ☐ Over 50 years of age
15. Which is the highest level of education that you completed?
- ☐ High school
 - ☐ Diploma degree
 - ☐ College degree
 - ☐ Post graduate degree
 - ☐ Continuous education
 - ☐ Other...(specify)

16. Are you a member of any professional organisation?

☐ Yes

☐ No

17. Did your firm adopt computer prepress systems due to your recommendation?

☐ Yes

☐ No

18. How has the adoption of computer prepress systems in your firm changed your staff structure?

☐ Positions have been added

☐ Positions have been eliminated

☐ Responsibilities have been reassigned

☐ There have been no changes

19. What are your predictions for the future of computer prepress systems in Kuwait?

20. Do you have anything you would like to add?

Appendix B

DESIGNERS' SURVEY QUESTIONNAIRE



For purposes of this questionnaire, "computer prepress" means the computerisation of many of the operations (such as typesetting, page layout, production of camera-ready copy) involved in publication production.

The questionnaire falls into two sections, with a total of 30 questions. section I deals with general information; Section II has a more subjective angle and deals with how computerisation is affecting Arabic design.

Section I.

1. Please place a checkmark by all of the following prepress operations handled on computers in the production of your company's publications. If you select either of the last two choices, please respond then to Question 1B.

- ☐ Word processing
- ☐ Typesetting
- ☐ Computer generated graphics
- ☐ Page layout
- ☐ Production of camera-ready copy
- ☐ Colour separation
- ☐ Direct-to-plate
- ☐ Direct-to-print
- ☐ Other (specify)
- ☐ We use computers for word processing only.

(Please go on to Question 1B below and return your questionnaire.)

- ☐ We do not use computers for any prepress operations.

(Please go on to Question 1B below and return your questionnaire.)

- 1B. Are there plans in your company to move into computer prepress for the production of your publications within the next 12 months.

- ☐ Yes
- ☐ No

2. How many years has your firm been using in-house personal computers or a computer prepress system for magazine page layout/design and production?
 - ☐ Under one year
 - ☐ 1 - 2 years
 - ☐ 3 - 5 years
 - ☐ More than 5 years

3. Please indicate the frequency of publication for your magazine.
 - ☐ Weekly
 - ☐ Bi-monthly
 - ☐ Monthly
 - ☐ Quarterly
 - ☐ Other (specify)

4. How many pages per issue does your magazine typically run ?
 - ☐ Less than 20 pages
 - ☐ 21 to 30 pages
 - ☐ 31 to 40 pages
 - ☐ 41 to 50 pages
 - ☐ Over 50 pages

5. On the average, how many pages of your magazine in the following categories does your firm design and produce for each issue via personal computer/computer prepress?
 - ☐ All pages
 - ☐ More than half
 - ☐ Less than half

6. Please check the following type(s) of personal computer(s) that your firm is presently using, and note the specific model in the space provided.

<input type="checkbox"/> IBM	Model: _____
<input type="checkbox"/> IBM compatible	Model: _____
<input type="checkbox"/> Apple Macintosh	Model: _____
<input type="checkbox"/> Sun or other UNIX	Model: _____
<input type="checkbox"/> Other	Model: _____

7. Please check each of the following computer components that your firm is presently using.

- ☐ B&W printer
- ☐ Colour printer
- ☐ Laser printer (PostScript)
- ☐ Laser printer (non-PostScript)
- ☐ Photo typesetting
- ☐ Colour copier
- ☐ Colour monitor
- ☐ Full page B&W or colour monitor
- ☐ Scanner
- ☐ Modem
- ☐ Hard drives
- ☐ Tape drives
- ☐ Integrated desktop system/workstations
- ☐ Other. Please specify

8. Please check each of the following types of computer software that your firm is presently using.

- ☐ Word processing
- ☐ Spreadsheets
- ☐ Page composition
- ☐ Clip Art
- ☐ Graphics (charting)
- ☐ Graphics (illustration/paint/draw)
- ☐ Photo/Image enhancement
- ☐ Database management
- ☐ Scheduling/planning/job tracking
- ☐ Communication/translation
- ☐ Scanning
- ☐ Other (specify)

9. Please check all the specific English software your firm is presently using in prepress operations.

- ☐ PageMaker
- ☐ Ventura
- ☐ Ready, Set, Go
- ☐ Design Studio
- ☐ Quark Xpress
- ☐ Adobe Photoshop
- ☐ Freehand
- ☐ Illustrator
- ☐ Other (specify)

10. Please check all the specific Arabic software your firm is presently using in prepress operations.
- ☐ Al-Katib Al-Dawli
 - ☐ Al-Nashir Al-Maktabi
 - ☐ Al-Nashir Al-Sahafi
 - ☐ Quark Arabic Extension
 - ☐ Kalimat
 - ☐ Arabic PageMaker
 - ☐ WinText
 - ☐ Art Beat
 - ☐ Arabic Claris Works
 - ☐ Other (specify)
11. What is your title or position?
- ☐ Art Director
 - ☐ Designer
 - ☐ Graphic Artist
 - ☐ Other (specify)
12. How long have you been with the firm you now work for?
- ☐ Less than 5 years
 - ☐ 6 to 10 years
 - ☐ Over 10 years
13. What is your age?
- ☐ Under 20 years of age
 - ☐ 21 to 25 years
 - ☐ 26 to 30
 - ☐ 31 to 35
 - ☐ 36 to 40
 - ☐ 46 to 50
 - ☐ Over 50 years of age
14. Which is the highest level of education that you completed?
- ☐ High school
 - ☐ Diploma degree
 - ☐ College degree
 - ☐ Post graduate degree
 - ☐ Continuous education
 - ☐ Other (specify)

15. Did you require any retraining when your firm added computers for page design and production?
- ☐ Yes
 - ☐ No
16. If you did require training on computers, how did you receive this training?
- ☐ In -house training
 - ☐ Dealers and vendors
 - ☐ Attending courses
 - ☐ Books or videos
 - ☐ Reading manuals
 - ☐ Other (specify)
17. How many people are employed by your firm (in the publication production division)?
- ☐ Less than 10 employees
 - ☐ 10 to 30
 - ☐ 31 to 50
 - ☐ 51 to 70
 - ☐ Over 70 employees
18. Are you involved in the purchasing decisions for your firm's personal computer/computer prepress system?
- ☐ Yes
 - ☐ No
19. Which other individuals on your publication production staff in your firm are involved in the decisions to purchase personal computer/computer prepress equipment?
- ☐ Publisher
 - ☐ Financial Officer
 - ☐ Production Management
 - ☐ Advertising/Sales Promotion Management
 - ☐ Editorial Management (including Managing Editor)
 - ☐ Circulation Management
 - ☐ Other (specify)
20. Is your firm a member of any professional organisation?
- ☐ Yes
 - ☐ No

Section II.

The point of these questions is to determine how the computer has changed the process in your firm for page design and production and how the computer is affecting Arabic design itself. Some of these questions will ask you to elaborate on your responses. Please feel free to write in your thoughts and experiences.

21. Why did your firm begin to use personal computers/computer prepress in page design and production? (Please rank your choices with "1" as the most important)
- ☐ Save money
 - ☐ Save time, speed production process
 - ☐ More flexibility
 - ☐ Reduce workload
 - ☐ Other (specify)
22. Please note here which, if any, of the reasons listed in Question 21 have been realised.
- ☐ Save money
 - ☐ Save time, speed production process
 - ☐ More flexibility
 - ☐ Reduce workload
 - ☐ Other (specify)
23. Please estimate the percentage of time your firm has saved in the production process (from finished manuscript to final page form) by using personal computer/computer prepress.
- ☐ Less than 10%
 - ☐ 10%
 - ☐ 20%
 - ☐ 30%
 - ☐ 40%
 - ☐ 50%
 - ☐ Over 50%
24. Since computerising page design and production at your magazine, have you increased or reduced your staff? If you have seen such increase or reduction in staff, please estimate the percentage of the change?
- ☐ No reduction
 - ☐ 1% - 9% reduction
 - ☐ 10% - 19% reduction
 - ☐ 20% - 29% reduction
 - ☐ 30% - 39% reduction
 - ☐ 40% - 49% reduction
 - ☐ 50% or more reduction

- ☐ No increase
- ☐ 1% - 9% increase
- ☐ 10% - 19% increase
- ☐ 20% - 29% increase
- ☐ 30% - 39% increase
- ☐ 40% - 49% increase
- ☐ 50% or more increase

25. In your firm's use of personal computer or a computer prepress system for publication page design and production, who is at the workstation composing the pages?

- ☐ Editor
- ☐ Managing Editor
- ☐ Art Director/Editor
- ☐ Graphic Artist
- ☐ Production Staff Member
- ☐ Keyboard operator
- ☐ Other (specify)

26. Who is responsible for the day-to-day planning of the operation of your firm's personal computers/computer prepress system(s)?

- ☐ Editor
- ☐ Managing Editor
- ☐ Art Director/Editor
- ☐ Graphic Artist
- ☐ Production Staff Member
- ☐ Keyboard operator
- ☐ Other (specify)

27. How has the addition of an computer prepress changed your staff structure and responsibilities in the design and production of pages?

- ☐ Positions have been added
- ☐ Positions have been eliminated
- ☐ Responsibilities have been reassigned
- ☐ There have been no changes

28. Please identify how strongly you agree or disagree with the following statements by checking your choice.

The implementation of computer prepress has had an impact on the process of page design and production of your magazine.

- ☐ Strongly agree
- ☐ Agree

- ☐ No opinion
- ☐ Disagree
- ☐ Strongly disagree

29. The impact on this process has been an improvement.

- ☐ Strongly agree
- ☐ Agree
- ☐ No opinion
- ☐ Disagree
- ☐ Strongly disagree

30. The computer has had an impact on the overall design of your magazine.

- ☐ Strongly agree
- ☐ Agree
- ☐ No opinion
- ☐ Disagree
- ☐ Strongly disagree

Please comment on anything you would like to add (use additional sheets)
